EVIDENCE BASED ASSESSMENT OF PUBLIC HEALTH PLANNING:
A CASE STUDY OF THE 2014 CRISIS IN UKRAINE

A thesis presented to the Faculty of the U.S. Army
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fulfillment of the requirements for the
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by

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The 2014 crisis in Ukraine presents an opportunity to evaluate public health planning support for a nation experiencing armed conflict. Historical evidence supports the findings of mortality, tuberculosis, and cholera as appropriate metrics to define the state of public health planning support for a given nation. Data from these metrics demonstrate the results of potential threats to public health planning. Potential threats induce risk into a system and can be magnified when affected by multiple sectors, such as considered in for the domains of politics, military, social, economic, and information. Together, the risks can quickly overwhelm a public health system. When this happens, external organizations in the region and international community must respond to maintain their own national interests. Analysis provided several findings for Ukraine's public health planning effectiveness after experiencing armed conflict. As a result of the crisis, health care infrastructure was destroyed, health care workers fled, migrating patterns of vulnerable populations increased, and logistical lines of communication were disrupted. These triggers diminished the capabilities of Ukraine's public health planning. The international community responded, but true costs are yet unknown. Future study should apply real options theory to costs and requirements associated with Ukraine's capacity for public health planning to estimate an actual cost of this crisis.

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statement.)

ABSTRACT

EVIDENCE BASED ASSESSMENT OF PUBLIC HEALTH PLANNING: A CASE STUDY OF THE 2014 CRISIS IN UKRAINE, by Major Autumn Leveridge, 101 pages.

The 2014 crisis in Ukraine presents an opportunity to evaluate public health planning support for a nation experiencing armed conflict. Historical evidence supports the findings of mortality, tuberculosis, and cholera as appropriate metrics to define the state of public health planning support for a given nation. Data from these metrics demonstrate the results of potential threats to public health planning. Potential threats induce risk into a system and can be magnified when affected by multiple sectors, such as considered in for the domains of politics, military, social, economic, and information. Together, the risks can quickly overwhelm a public health system. When this happens, external organizations in the region and international community must respond to maintain their own national interests. Analysis provided several findings for Ukraine's public health planning effectiveness after experiencing armed conflict. As a result of the crisis, health care infrastructure was destroyed, health care workers fled, migrating patterns of vulnerable populations increased, and logistical lines of communication were disrupted. These triggers diminished the capabilities of Ukraine's public health planning. The international community responded, but true costs are yet unknown. Future study should apply real options theory to costs and requirements associated with Ukraine's capacity for public health planning to estimate an actual cost of this crisis.

ACKNOWLEDGMENTS

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ACRONYMS

AMEDD	United States Army Medical Department
DoD	United States Department of Defense
EU	European Union
EUCOM	United States European Command
EUPHA	European Public Health Association
GHE	Global Health Estimate
IGO	Inter Governmental Organization
JTF	Joint Task Force
NGO	Non Governmental Organization
RAF	Regionally Aligned Force
US	United States
USG	United States Government
WHO	World Health Organization

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CHAPTER 1

INTRODUCTION

Background

The planning for public health is a complex challenge that has involved societies over the past two millennia. Hippocrates writes of public health considerations of air, water, and places; John Snow writes of cholera transmission; Robert Koch of tuberculosis; and Florence Nightingale details sanitation issues of health care facilities.[1] These demonstrate how recurring themes in public health and with sanitation include both the person and the environment.

The challenge of public health planning support with respect to the person includes disease transmission, germ theory, and appropriate interventions. The challenge of public health planning support with respect to the environment includes establishing and sustaining sanitary and stable conditions. These challenges pose risk to public health because of their potential for morbidity and mortality from preventable disease or environmental injury. Challenges to planning for public health support each have an associated cost, whether direct or indirect. Causes of indirect costs are of greater complexity, such as the case of political, economic, or military instability. Resources are limited and can often be diverted to other sectors.

Some of the other sectors that compete for resources of foreign assistance with public health include peace and security; democracy, human rights, and governance;

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[1] Dona Schneider and David E. Lilienfeld, eds, "Part I Early Roots, Chapter I Hippocrates," in *Public Health: The Development of a Discipline: from the Age of Hippocrates to the Progressive Era, Volume 1* (New Brunswick, NJ: Rutgers University Press, 2008), 5-24.

education and social services; economic development; environmental protection; and humanitarian assistance.[2] To maximize the opportunities for success in countering challenges to public health planning support, each of the sectors must understand and internalize a collaborative approach to resourcing. With competing interests among sectors, planners of public health can leverage shared values from other sectors of common problems, to plan mutually beneficial strategies.

Just as a commander on the battlefield must understand, visualize, describe, and direct planning and support of military operations, so to must planners of public health understand the operational environment and associated challenges, visualize strategies to counter challenges to public health, describe a path to a desired healthy environment, and direct and manage resources in an iterative manner.[3] Key to the iterative process is assessment based upon evidence.

Understanding what challenges affect public health planning support can better help to evaluate roles and responsibilities of the international community, the European Union, and eastern European states, specifically Ukraine. Gathering appropriate evidence when a region is facing a crisis due to war or conflict can be a significant challenge to public health planning support. A qualitative analysis of why the historical models changed, with a focus on crises due to war or conflict, can help to provide patterns of

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[2] US Government, "Open Government Initiative," accessed 27 March 2015, foreignassistance.gov.

[3] US Department of the Army, Army Doctrine Reference Publication (ADRP) 5-0, *The Operations Process* (Washington, DC: Department of the Army, May 2012), 1-1 to 1-7.

evidence to inform how the United States (US) Department of Defense may be expected to fill gaps for the future. Quantitative patterns help validate the qualitative themes.

Thesis Statement

Sustaining public health planning support is a critical national interest because of its intersectoral nature, ability to negatively affect a society if not properly managed, and capability to reduce threats and maximize opportunities.

Research Questions

Primary Research Question

Considering the crisis in Ukraine in 2014 as a model, what evidence does the model provide to planners to inform how external organizations may be expected to fill gaps in public health support for the future?

Secondary Research Questions

1. What are the metrics that help define the state of public health support in a nation?

2. What threats, challenges, or gaps in the identified metrics of the public health support system should planners expect to find in a crisis due to war or conflict?

3. How does an intersectoral approach affect the identified metrics of the public health support system?

4. What role should the external organizations, including World Health Organization, the European Union, the United States, or others play in supporting areas in the European region that are not capable to effectively

administer public health support systems on their own when a regional crisis

due to war or conflict arises?

Underlying Assumptions

The US, other governments, intergovernmental organizations (IGOs), and

nongovernmental organizations (NGOs) will continue to provide resources in support of

nations in crisis. These groups understand the exponential costs of failing to support

efforts in public health planning and response. The US will employ interagency resources

as well as the Department of Defense (DoD), in joint task force (JTF) or interagency or

multinational task forces. The US budget (deficit) will continue to be a constraint on the

ability to provide more long-term support, but there will always be the case in which it is

in the US national interest to respond. This will be a similar assumption for the European

Union and others in the international community.

Scope, Limitations, and Delimitations

The scope of this study seeks to address implications of public health planning

during armed conflict using the crisis in Ukraine in 2014 as a case study. Although

disasters, conflicts, communicable disease, and social challenges are all sources of crisis

affecting the ability of a nation to effectively provide public health planning support, it is

the destabilization from armed conflict that can most disrupt efficient and effective

response to public health needs.[4] This type of conflict sets the conditions for greater

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[4] World Health Organization, *Assessment of Health Systems' Crisis Preparedness: Ukraine, May 2009* (Copenhagen, Denmark: WHO Regional Office for Europe 2012), accessed 11 February 2015, http://www.euro.who.int/__data/assets/ pdf_file/0008/112202/E93851.pdf.

likelihood for the spread of infectious disease, such as can be seen in pandemics or epidemics. Combining the risk factors can increase potential severity, such as how public health challenges from the social conditions of poverty can be exacerbated by lack of sanitation caused by destruction of critical infrastructure occurring during armed conflicts.

The ability to provide public health planning support when it is most needed, during a regional crisis, is a world-wide problem. However, this study focuses on the assessment of an area in the Eastern European region, Ukraine. The scope was chosen for several limiting and delimiting reasons.

Limiting factors primarily included data available for the selected sample. Data included literature and statistics taken from publicly available sources, largely through access from the Combined Arms Research Library. Health statistics were referenced from the World Health Organization, the World Bank, and the European Commission Eurostat and were limited to sample types and sample sizes available in those databases.

In addition to the limiting factors, several delimiting choices were made. The choices include geographical location and population, source information, and methodological procedures. Although public health planning support in times of crisis is a world-wide problem, this study will not examine areas outside the Eastern European region, but focuses on Ukraine as a case study. Although comparable to other geographical areas, the goal is to concentrate on assessing available data in the Eastern European region to better understand what elements of public health planning support show levels of success and what elements do not appear to be successful in order to identify recommended areas of focus for improvement. The source information for this

study does not include comparative statistics from all available databases, but instead focuses on selected data referenced primarily from the World Health Organization, the World Bank, and the European Commission Eurostat. The focus of the study assesses overall mortality and mortality due to tuberculosis. Other data samples may be relevant for future study, but are not included in this monograph.

<u>Significance of the Study</u>

This research seeks to add to the body of knowledge and help to fill gaps in understanding sustainable elements of public health planning support for an eastern European state during a time of crisis. Regional crises in the form of armed conflicts with state and/or non-state actors are cyclic. Infrastructure is destroyed, healthcare providers are displaced or leave intentionally, medical materiel availability is unreliable at best, and available funds are depleted. When public health planning support is devastated from regional crisis, other outside organizations become much more involved. It takes many resources to mobilize a reaction force, including personnel, equipment, funds, and time. Time may be the most critical as greater numbers of people are at risk to become victims. The disruption of the normal health care delivery system poses many potentially severe risks to public health. Finding ways to effectively and efficiently provide public health planning support in a very short time is critical. However, it should be based upon evidence. Evidence based design methodology to inform goal development for public health planning support during a time of regional crisis should help to validate the feasibility and suitability of the goals.

CHAPTER 2

LITERATURE REVIEW

Evidence based design methodology is a process to assess relevant factors of public health planning support. Four areas are considered in this study and are applied to the country of Ukraine as a case study. The first are public health metrics that can best evaluate that country's public health system's planning and support. When disease rates illuminate an area of concern, investigators can research causes and risks. Risks become more complicated when a country is experiencing armed conflict. Risks also become more complex when considering the interrelated nature of other sectors' responses to armed conflict. Yet, the interrelated nature of sectors provides an opportunity to help develop strategies to mitigate the risks to public health planning when a nation is experiencing armed conflict. Leveraging capabilities of external organizations can help to prevent maximum possible death and disease, epidemics, and total destruction of the public health planning system. Understanding the operational environment in the 2014 crisis in Ukraine as it relates to the public health planning system provides evidence to external organizations what strategies should be employed.

Metrics to assess Public Health Planning

The ability to evaluate measures of public health planning is dependent upon the ability to understand the operational environment, collect valid data, and effectively and efficiently respond to the evidence with greatest flexibility. Appendix A documents public health themes from the perspective of different organizations. Although the

perspective of public health planning for each organization is not identical, the common themes include surveillance and response in the domain of public health.

Identifying applicable metrics helps planners understand the operational environment. Metrics in public health planning can include deaths, death rates, disability-adjusted life years (DALYs), incidence or prevalence of disease, and others.[5] Cholera rates are of interest because of the short incubation period and short time to mortality when conditions are set that prevent proper sanitation and treatment capabilities. Mortality due to tuberculosis is of interest in this study because of its previous effects over time in the Eastern European geographical region and because of the potential to spread to other geographical regions in the future.

Mortality Rates

Mortality data helps inform public health planners of the status of health and disease in a population. In the health sector, mortality data is used to "identify high-mortality areas and high-risk groups within areas, so that health sector resources can be directed where they are needed and are likely to have most effect."[6] The data provides indicators to what areas may have problems based upon undesired trends or spikes in reporting. Similarly, gaps in reporting can indicate problems in the surveillance systems. When a suspicious trend, spike, or gap occurs, public health planners can respond to investigate the causes and determine a mitigation strategy.

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[5] World Health Organization, *Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks* (Geneva, Switzerland: WHO Press, 2009), 5.

[6] Kenneth Hill, "Uses of Mortality Data for Planning and Research," in *Data Bases for Mortality Measurement* (New York: United Nations Publications, 1984), 16.

Cholera

Cholera is caused by the *Vibrio cholera* bacterium that is curve-shaped and is found in shallow waters that are warm, organic, or salty such as along the coast or in estuaries.[7] They are ingested, colonize in the small intestine, and are passed from human stool to the environment.[8] Contributing factors to increased cholera rates include population density, poor sanitation, poor health infrastructure, and poor logistical support; after the 2010 disaster in Haiti, high case-fatality rates were recorded as a result of increased cholera transmission.[9]

These factors and results can be expected as a result of armed conflict. When this situation arises, people are displaced from their homes. Increased migration occurs when refugees either flee the country or move into camps for internally displaced persons (IDPs). Strains resistant to antibiotics are being increasingly found and cases of cholera are often under-reported.[10] When regular public health planning surveillance methods are disrupted during an armed conflict, it can be even more difficult to identify and document cases and strains of cholera.

The reason why monitoring of cholera rates is so important is because of its relatively short incubation period and high death rates. Harris et al. reference an incubation period ranging from 12 hours to five days and death rates exceeding 70

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[7] Jason B. Harris et al., "Cholera," *The Lancet* 379, no. 9835 (June 2012): 2466-76.

[8] Ibid.

[9] Ibid.

[10] Ibid.

percent.[11] During armed conflict when public health planning for surveillance and response is compromised, the conditions are set for a mass casualty situation due to cholera.

Tuberculosis

Tuberculosis (TB) is an infectious disease that is highly communicable. It is caused by the contraction of tuberculosis bacilli, an approximately two micrometer diameter germ that is typically inhaled into the lungs, and can spread from the lungs to lymph nodes, larynx, intestines, kidneys, bones (including spinal column), or the brain.[12] The bacilli's waxy coating and relatively long replication life cycle are factors that make it difficult to destroy.[13] TB requires high levels of oxygen and causes tissue destruction called caseous necrosis.[14] The body's microphages and cilia fight against TB often aided by medicines; however, when the human immune system is lowered or the infected person does not comply in taking the medicines as directed, the risks for infection increases and the ability to successfully treat the TB decreases.[15] Contributing factors can include smoking, alcohol, depression, drug addiction, homelessness, among other

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[11] Ibid.

[12] Howard Markel, *"Facing Tuberculosis," When Germs Travel: Six Major Epidemics That Have Invaded America Since 1900 and the Fears They Have Unleashed* (New York: Panthenon Books, 2004), 24-28.

[13] Ibid., 26, 42.

[14] Ibid., 26.

[15] Ibid., 24, 25, 42, 43.

factors.[16] The modes of transmission and contributing factors make TB a significant risk to public health. The risk increases with more contributing factors.

Tuberculosis presents a risk to public health. One third of the global population is estimated to be infected with latent tuberculosis, at least ten percent are predicted to develop the active form, and an estimated three million people die each year from TB; multi-drug resistance is expected in at least one of ten cases and the rates have been found higher in areas of the former Soviet Union.[17] This evidence shows that the risk to public health is widespread and that public health planning support is critical to mitigate the risks. Key to developing risk reduction strategies is understanding the operational environment.

Transmission of TB is often misunderstood. Not until the 1880s was the cause of TB as a hereditary disease invalidated with Koch's identification of *Mycobacterium tuberculosis*; not until the 1960s did Riley demonstrate Wells' airborne theory, that the tubercle bacillus was transmitted through the air, causing TB infection to guinea pigs in a separate room.[18] Even through Waksman's discovery in the 1940s that the antibiotic streptomycin, from *Streptomyces griseus*, had effects as an anti-tuberculosis medicine, by the 1950s he realized how drug-resistance could limit the effectiveness of streptomycin.[19] According to the World Health Organization, the Eastern European region has some of

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[16] Ibid.

[17] Ibid., 15-18.

[18] Ibid., 28-34.

[19] Ibid., 41-42.

the highest reports of multidrug-resistant (MDR) TB rates worldwide.[20] This

demonstrates how the inability to fully understand the problem can result in public health

planning strategies that are not completely safe or effective. It also shows why

surveillance is critical in public health planning.
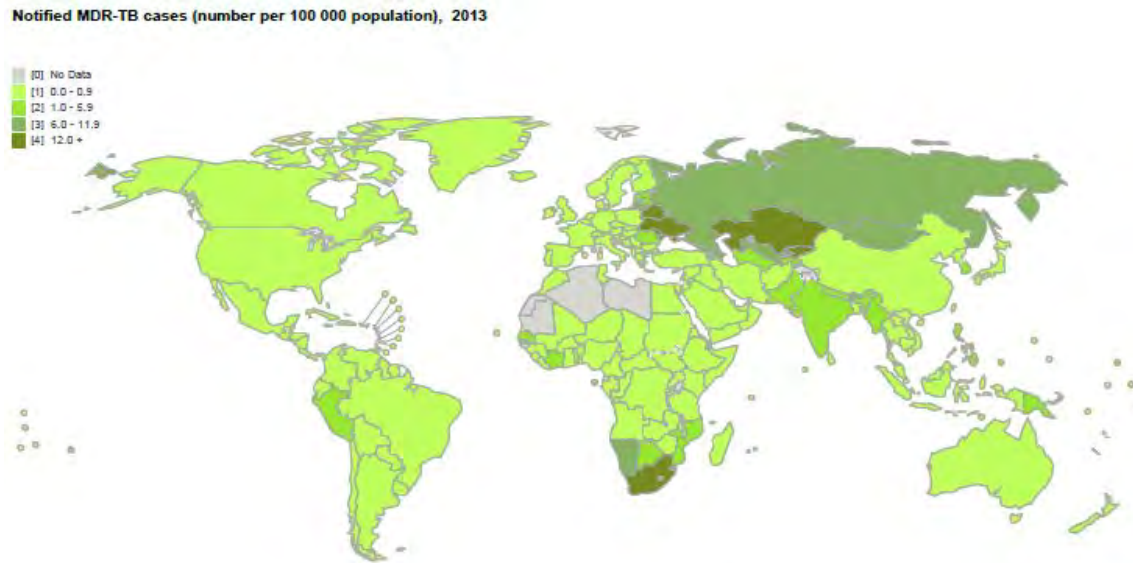
Figure 1.   Reported Cases per 100,000 Population of Multidrug-resistant TB (2013)

Source: World Health Organization, "Notified MDR-TB Cases (number per 100 000 population), 2013," accessed 9 March 2015, https://extranet.who.int/sree/Reports?op= vs&path=/WHO_HQ_Reports/G2/PROD/EXT/MDRTB_Indicators_map.

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[20] World Health Organization, "Notified MDR-TB Cases (number per 100 000 population), 2013," accessed 9 March 2015, https://extranet.who.int/sree/Reports?op= vs&path=/WHO_HQ_Reports/G2/PROD/EXT/MDRTB_Indicators_map.

Surveillance of mortality data over time and in relation to other geographical

areas can help identify areas of concern for public health.[21] Surveillance helps public

health planners understand the environment. A metric that is out of tolerance, out of

statistical process control, or found to be statistically significantly worse over time or as

compared to other regions provides evidence that an existing response should be

investigated or additional measures should be implemented. Tolerance levels are adapted

over time for goals that best meet public health needs. Without data collection, the

understanding of the public health environment cannot best be informed by evidence.

When data is not available, there can be indication that challenges to regular

methods of surveillance may be for a variety of reasons including no one is available to

collect the data; there is not a physical method to collect, store, or transport the data; or

the population the data might come from is not available. This affects the ability to plan

interventions.

Planning interventions and being able to respond to metrics in public health

planning provides greater flexibility. Surveillance shows that change is common and

greater flexibility sets conditions to efficiently and effectively utilize interventions in

response. "When a trigger occurs, the organization has already planned a response."[22]

Hamilton discusses how the scale and pace of change affect flexibility and how defining

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[21] Surveillance data is available from organizations such as European Union's Eurostat, The World Bank Open Data, United States Census Bureau's International Data Base, World Health Data and Statistics, Institute for Health Metrics and Evaluation, etc.

[22] D. Kirk Hamilton, "Flexibility, Differential Obsolescence, and Measurement," *Health Environments Research and Design Journal* 4, no. 4 (2011): 109-113.

a scale of flexibility can convert qualitative intuition into quantitative evidence.[23] For

public health planning, responding to evidence of increased mortality, disease incidence,

and availability of resources can be scaled based upon the situation. Effectively

responding to the evidence can be challenging in the most ideal situations, but even more

difficult in regional, civil, or armed conflicts.

<div align="center">

Risks to Public Health Planning
during Armed Conflict

</div>

Consideration of risks to public health planning during an armed conflict is

relevant due to several factors. First, the unchanging nature of risk in project planning for

a public health planning initiative is an element that can be expected in each unique

project. Second, the consideration for public health planning framed as a set of projects

aids understanding what are core problems and what may be outliers. Additionally, the

importance of systematically assessing the changing character of risks in the operational

environment of public health planning can help to best mitigate associated hazards.

Risk is the combination of the probability and severity of an event and can be

described in categories, or types based upon the scale of known and unknown conditions.

The nature of risk is present in each project or situation, even as the conditions vary. The

likelihood of the event has a relationship with the severity of the event described as "loss

linked to hazards."[24] Logan explains the importance of considering the combinations of

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[23] Ibid.

[24] Joint Chiefs of Staff, Joint Publication (JP) 5-0, *Joint Operation Planning* (Washington, DC: Joint Chiefs of Staff, August 2011), IV-11.

known and unknown conditions in hypothesis testing.[25] Yet the combinations Logan

discusses: known-knowns, known-unknowns, and unknown-unknowns does not include

unknown-knowns. Unknown-knowns are conditions that despite the presence of evidence

or information that is known to others which may be relevant to the project or situation,

are unknowingly not considered to the planners involved in a specific situation. In

considering expectations and results, each of these four conditions can be used to

categorize potential types of risk to public health planning during an armed conflict.
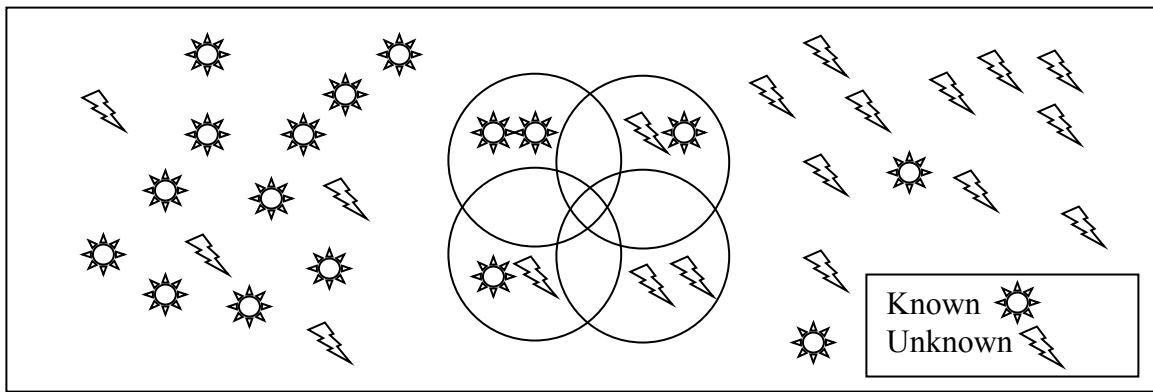
Figure 2.   Combinations for Known and Unknown Conditions

Source: Figure adapted by author from David C. Logan, "Known Knowns, Known Unknowns, Unknown Unknowns and the Propagation of Scientific Enquiry," *Journal of Experimental Botany* 60, no. 3 (March 2009): 712-714.

Risk management in project planning is conducted over the project life cycle.

Risk in public health planning, as noted in Appendix A, Public Health Themes, can be

diverse and evaluated individually or as a set of projects or situations. For example,

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[25] David C. Logan, "Known Knowns, Known Unknowns, Unknown Unknowns and the Propagation of Scientific Enquiry," *Journal of Experimental Botany* 60, no. 3 (March 2009): 712-714.

reduction of mortality over time can be considered as one project in public health planning. Reduction of mortality over geographical area can be considered as another project in public health planning. Generally in project planning, the ability to influence is greater and the cost is lower earlier in the time scale.[26] The typically inverse relationship does not assume there cannot be spikes in costs or influence over time, which can be related to the combinations of known and unknown conditions of risk. However, generally, if mitigating strategies can be applied earlier in the time scale, there exists the opportunity to prevent other cascading effects of the hazard.

Public health planning risk mitigation strategies vary with the changing character of risk. Time and geography are factors that affect the operational environment and risk to public health planning during armed conflict. Within space and time the framing construct includes many other variables across the range of political, social, economic, military, and information domains. For example, the military domain includes relationships between operational and mission variables as part of its framing construct.[27] What is not always shown is each of the functional interrelationships. For example, the operational variable, infrastructure does not show an arrow connecting it directly to the mission variable, medical. However, health care facility infrastructure, electrical

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[26] Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 4th ed. (Newton Square, PA: Project Management Institute, 2008), 17.

[27] US Department of the Army, Army Doctrine Reference Publication (ADRP) 3-90, *Offense and Defense* (Washington, DC: Department of the Army, August 2012), 2-1; US Department of the Army, Field Manual 3-34.170, *Engineer Reconnaissance* (Washington, DC: Department of the Army, March 2008).

supporting infrastructure, and sanitation (water and sewage) infrastructure are each

critical to providing a stable environment for delivery of public health.
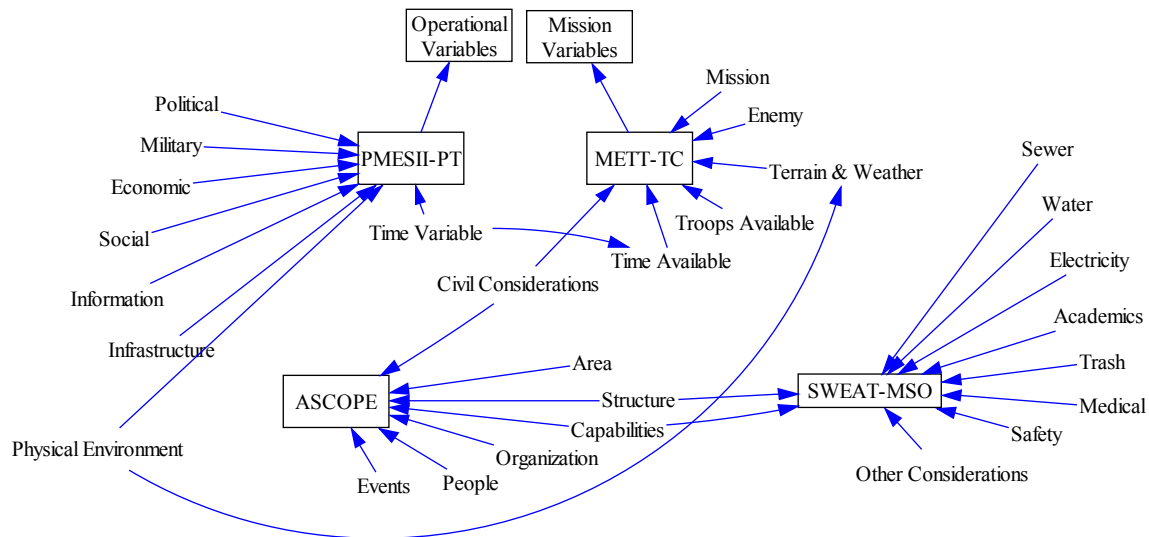
Figure 3.   Selected Framing Construct Elements
in Military Domain

Source: Adapted by author from MilBook. "DTAC Doctrine Mat Official V2," 1 August 2013, accessed 6 August 2014, https://www.milsuite.mil/book/docs/DOC-159802.

In preparing support for public health planning, planners must consider many

risks that can occur during armed conflict. With respect to people and their environments,

there are several critical risks to public health systems in areas of armed conflict. They

include resource availability, reporting mechanisms, and security.

Risks to resourcing can be material or environmental. Material resource risks

include medical supplies, immunizations and medicines, health care providers, health

care facilities, other public health facilities, and funding among other material risks.

Environmental resource risks include clean air and water.

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With limits to resources, reporting mechanisms become more challenging. Without the ability to report and document the reports, surveillance reliability decreases. When data is less reliable, it presents a risk to successfully employing that evidence. There becomes a greater challenge to use that evidence to most appropriately plan and execute strategies to mitigate risk.

The driving critical risk is security. In an unstable area problems with security affect both resource availability and reporting mechanisms. An insecure area often includes fear and destruction, resulting in less resources available to support planning and delivery of public health.

Systematically assessing the changing character of risks in the operational environment of public health planning is important to be able to mitigate associated hazards. The systematic assessment is part of surveillance. Surveillance informs response. Surveillance and responses are limited by security. Changes affecting resourcing, reporting, and security during an armed conflict are interrelated to the various sectors in that environment.

<center>Interrelated nature of Sectors
during Armed Conflict</center>

Public health planning is not managed in a vacuum. Planners work to integrate other sectors through approaches such as health in all policies (HiAP).[28] In a November 2013 conference in Vilnus, Lithuania focused on the "sustainable health care system for comprehensive growth in Europe" by considering mitigating strategies against risks in

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[28] World Health Organization, *Noncommunicable Diseases Prevention and Control in the South-Eastern Europe Health Network: An Analysis of Intersectoral Collaboration* (Copenhagen, Denmark: WHO Regional Office for Europe, 2012), iv.

budget shortages and health inequality.[29] In general, other sectors of consideration affecting public health planning include the political, social, military, economic, and informational sectors.

Despite laws intending to protect the health of the people, there is evidence that during conflict those laws are not always adhered to.[30] Evidence shows that violations include attacks and misuses of medical functions including wounded and sick individuals, medical providers, health care facilities, and lines of communication (transportation and logistics).[31] Out of the 22 countries studied from 2003 to 2008, at least two-thirds of countries were affected in all of these categories.
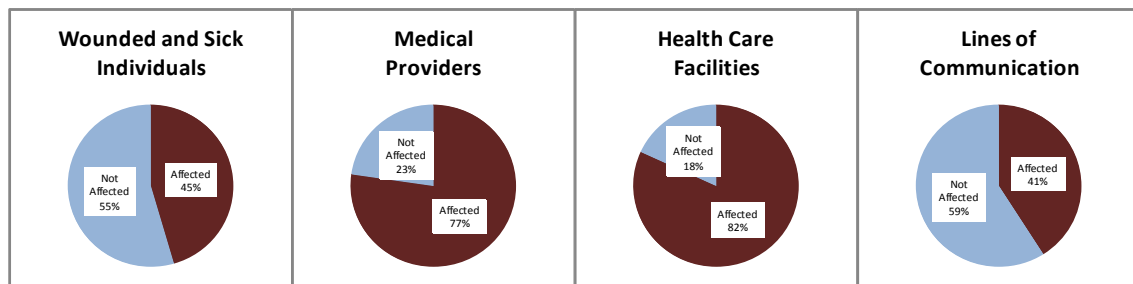
Figure 4.   Percent of 22 selected Countries affected by the Violation
of Medical Function from 2003 to 2008

Source: Figure adapted by author from Leonard S. Rubenstein and Melanie D. Bittle, "Responsibility for Protection of Medical Workers and Facilities in Armed Conflict." *The Lancet* 375, no. 9711 (January 2010): 329-340.

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[29] World Health Organization, "Regional Director meets with Ukrainian Minister of Health," 29 November 2013, accessed 11 February 2015, http://www.euro.who.int/ en/countries/ukraine/news/news/2013/11/regional-director-meets-with-ukrainian-minister-of-health.

[30] Leonard S. Rubenstein and Melanie D. Bittle, "Responsibility for Protection of Medical Workers and Facilities in Armed Conflict," *The Lancet* 375, no. 9711 (January 2010): 329-338.

[31] Ibid.

Because of the interrelated nature of sectors, a collaborative approach can best help address the risks to metrics of public health planning during an armed conflict. One way to help identify areas of collaboration is by stream analysis. Through stream analysis, planners can use an intersectoral approach to identify core problems.[32] By identifying evidence of core problems, each of the sectors can understand what challenges are in common, and what opportunities might be possible to counter the challenges. In order to understand who can best help counter the different core problems, planners must consider what stakeholders are involved. External stakeholders have an opportunity to provide support to the affected region.

<div align="center">External Organizations support
to the affected Region</div>

Governments employ measures in emergency management, disaster prevention, and crisis preparedness to counter the effects of the crisis and improve the capabilities of public health planning support. Especially in nations experiencing conflict, governments are challenged to manage public health planning support alone. The international community, the European Union, and other Eastern European states are all stakeholders that have capacity to provide external support to public health planning. Based upon the identified gaps, external organizations plan for providing resources such as personnel, materiel, and training in order to counter the public health threats for the population at

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[32] World Health Organization, *Noncommunicable Diseases Prevention and Control in the South-Eastern Europe Health Network*; Michael I. Harrison and Arie Shirom, *Organizational Diagnosis and Assessment: Bridging Theory and Practice* (Thousand Oaks, CA: SAGE, 1999); Peter J. Robertson, Darryl R. Roberts, and Jerry I. Porras, "Dynamics of Planned Organizational Change: Assessing Empirical Support for a Theoretical Model," *Academy of Management Journal* 36, no. 3 (June 1993): 619-634.

risk. Needs are often evaluated through international efforts such as conference goals, policy integration, and value- and evidence-based frameworks for immediate, near, and long term courses of action.

Over the years, the international community has worked towards providing measures to address public health planning support. International Sanitary Conferences were held starting in 1851 and held periodically through 1938.[33] The World Health Organization started the first World Health Assembly in 1948 and continues to the present day.[34] International Health Regulations were published in 1969 and 2005.[35] These initiatives demonstrate the international recognition that planning for public health is an investment in the world's global society. Investment in public health planning supports national interests in many domains, but ultimately supports the fundamental human right to health.

The 1978 Declaration of Alma-Ata asserted health as a fundamental human right and that it is the responsibility of the individual and of the government in order to support economic development, social development, improved quality of life, and peace.[36] The

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[33] Norman Howard-Jones, "The Scientific Background of the International Sanitary Conferences 1851-1938," World Health Organization, Geneva, 1975. The conferences were held in the following years: 1851, 1859, 1866, 1874, 1881, 1885, 1892, 1893, 1894, 1897, 1903, 1907, 1911, 1926, 1938.

[34] World Health Organization, "First World Health Assembly," accessed 11 February 2015, http://www.who.int/global_health_histories/ first_world_health_assembly/en/.

[35] World Health Organization, "Core Functions of the IHR," accessed 11 February 2015, http://www.who.int/ihr/en/.

[36] World Health Organization, "Declaration of Alma-Ata" (International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978), accessed 11 February 2015, http://www.who.int/publications/almaata_declaration_en.pdf.

declaration recommends that nations should plan but also recognizes that political

support will influence codified plans. Without political, social, or economic support to

public health plans, the plans risk losing the ability to substantially affect change in areas

including surveillance and response. The document also suggests that nations should

spend less on arms and more on health. When nations are considering a limited budget,

priorities must balance the ability to fund initiatives, such as immunizations instead of

armaments. Surveillance, such as from external organizations like WHO, helps capture

the information needed to demonstrate, for example, why in many situations

immunizations might take a higher priority.

  The WHO's "Health 2020" addresses a framework for Europe that is both value-

and evidence-based and presents roles, responsibilities, and strategies for government to

address health response challenges.[37] The framework can help to establish on a

programmatic and long-term level where initiatives can be prioritized and funded from

today and years into the future. Nations working with external organizations, such as

WHO and others can assess gaps from year to year to help determine when greater

international support is needed. Key to understanding this part of the operational

environment is communications between partners, or stakeholders.

  The United States government (USG) is one of those stakeholders. Operation

Atlantic Resolve (OAR) is an example of an initiative that demonstrates US

"commitment to the collective security of . . . [NATO and partners in Europe], in light of

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[37] World Health Organization, *Health 2020: A European Policy Framework and Strategy for the 21st Century* (Copenhagen, Denmark: WHO Regional Office for Europe, 2013), 1-190.

the on-going Russian intervention in Ukraine."[38] OAR is complemented by the European

Reassurance Initiative (ERI), a $1 billion congressionally-approved funding package.

Interoperability, training, and capacity-building are among the objectives of OAR and

ERI. Exercises relevant to external support of public health planning include foreign

humanitarian assistance operations, peace support operations, and non-combatant

evacuation response operations. Specific support to Ukraine includes medical teams

deployed from US European Command (EUCOM) and medical supplies and MREs as

part of the foreign military financing. The OAR support can help to mitigate public health

planning problems from armed conflict such as attacks and misuses of medical functions

including wounded and sick individuals, medical providers, health care facilities, and

lines of communication (transportation and logistics).

<u>Ukraine as a Case Study</u>

Eastern European states that were former Soviet states had to adapt from the

Semashko health care model which was a centralized, government-provided health care

model developed circa 1918 as a response to the epidemics the Soviet Union faced after

war.[39] Ukraine is one of the former Soviet states under the Semashko model. Ukraine has

remnants of a health system cycled through effects of war and conflict, universal access

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[38] US European Command, "Operation Atlantic Resolve," Communication and Engagement Directorate Fact Sheet, 26 June 2014, accessed 24 January 2015, http://www.eucom.mil/operation-atlantic-resolve, 1-6.

[39] Valery Lekhan, Volodymyr Rudiy, and Erica Richardson, "Ukraine Health System Review," *Health Systems in Transisiton*,12:8, World Health Organization for European Observatory on Health Systems and Policies, Copenhagen, Denmark, 2010, 17.

issues, philosophies of primary care versus specialized care, and economic challenges.[40] Due to geographical and political factors, the interrelated nature of sectors during conflict, and conditions resulting in an environment not conducive to the planning and delivery of public health, the case study of Ukraine can provide evidence of public health planning support. This evidence can help planners understand how external organizations, including the USG and DoD, may be expected to fill future gaps.

The geography and political history of Ukraine are factors influencing conditions for public health support. Ukraine is geographically situated north of the Black Sea with Russia to the east and the rest of Europe to the west. Ukraine is a significantly larger land mass than most of other countries in Europe. This sets the conditions for pathways for people to migrate and lines of supply for others to disrupt.

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[40] Valery Lekhan, Volodymyr Rudiy, and Erica Richardson, "Ukraine Health System Review," *Health Systems in Transisiton*,12, no. 8 (2010); World Health Organization for European Observatory on Health Systems and Policies, Copenhagen, Denmark, 2010, 17-20.

Figure 5.   Geographical Location of Ukraine

Source: Figure adapted by author from amCharts, "Ukraine," Visited Countries Map, accessed 16 February 2015, http://www.amcharts.com/visited_countries/#UA.

Yet, populations in Ukraine have migrated over centuries. Hrushevsky and Allen chronicle the history of Ukraine from at least the fourth century until nearly the mid-twentieth century, describing the evolution of the different kingdoms and associated population migrations. In the fourth century, Greeks called the tribes that moved about between the Dniester in the west and Dneiper Rivers in the east of present-day Ukraine the Antae.[41] The Kieven Rus maximized the geography of the rivers flowing into the Black Sea up to the twelfth century.[42] Today, geography is one reason that Ukraine has experienced conflict from its Russian neighbor.

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[41] Michael Hrushevsky, *A History of Ukraine* (New Haven: Yale University Press, 1941), 20.

[42] W. E. D. Allen, *The Ukraine: A History* (Cambridge: Cambridge University Press, 1941), 8-23.

Since 1960, the population of Ukraine peaked in 1993 at approximately 52.1 million people and has steadily declined to approximately 45.4 million people as of 2013.[43] Population is another reason for the conflict with Russia. Of the approximately 45 million Ukrainians, about 7 to 8 million people living in the eastern side of Ukraine are ethnically Russian.[44] The regional crisis sets conditions for increases in individually displaced persons who seek asylum in other countries, resulting in a continued decrease of Ukraine's population.

The interrelated nature of conflict in the Ukraine with respect to the economy and security can each individually have significant effects on the planning and delivery of public health support. Together, they compound the risks associated with planning and delivery of public health. This sets the conditions for increased risk to public health support with a security crisis and less ability to provide economic support in response.

<u>Summary</u>

Understanding what metrics affect public health planning support can better help to evaluate roles and responsibilities of the international community, the European Union, and eastern European states, specifically Ukraine. An analysis of why the historical models changed, with a focus on crises due to armed conflict, can help to provide patterns of evidence to inform how the US Department of Defense may be expected to fill gaps for the future. For example, regionally aligned forces (RAF) provide

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[43] World Development Bank, "Population Total," Ukraine, accessed 9 March 2015, http://databank.worldbank.org/data.

[44] Rajan Menon and Alexander J. Motyl, "Counterrevolution in Kiev: Hope Fades for Ukraine," *Foreign Affairs* 90, no. 6 (November 2011): 137-148.

an option of capabilities for public health planning support during a regional crisis

response.[45]

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[45] U.S. Army, "20130422 RAF PAG: Public Affairs Guidance for the Regionally Aligned Force Concept," accessed 11 February 2015, https://www.us.army.mil/ suite/doc/39955729.

CHAPTER 3

RESEARCH METHODOLOGY

Chapter 3 explains the methods used to answer the primary research question: Considering the crisis in Ukraine in 2014 as a model, what evidence does the model provide to planners to inform how external organizations may be expected to fill gaps in public health support for the future?

Technique

With a case study methodology,[46] the issue of sustainable public health planning support during a crisis will be explored in the system of Eastern Europe with specific focus on the area of conflict vicinity Ukraine in order to describe the instrumental case and validate themes in the issue. Mixed methods data collection will have a qualitative focus primarily on the area of conflict vicinity Ukraine and a quantitative focus primarily assessing measures from Ukraine in comparison to other European areas. After reviewing ways to adapt this approach, a discussion of the step-by-step process to answer the research question is described.

Way to Adapt Approach

The method considers ways to measure the approach for answering the research question. Joint and US Army doctrine refer to measures of assessment in military

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[46] John W. Creswell, *Qualitative Inquiry and Research Design: Choosing among Five Approaches* (Thousand Oaks, CA: Sage Publications, 2007), 73.

planning.[47] Similarly, the commercial sector refers to measures of assessment in project

planning.[48]

Table 1.   Qualitative and Quantitative Comparison of Assessment Measures
in Military and Project Planning

Assessment Measure	Qualitative	Quantitative
Question	Will this meet our needs and achieve our end state?	Are we meeting standards of performance?
Project Planning	Validation *"The assurance that a product, service, or system meets the **needs** of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers. Contrast with verification."*	Verification *"The evaluation of whether or not a product, service, or system **complies** with a regulation, requirement, specification, or imposed condition. It is often an internal process. Contrast with validation."*
Military Planning	Measure of Effectiveness *"A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, an **objective**, or the creation of an effect. It measures the relevance of actions being performed."*	Measure of Performance *"A criterion used to assess friendly actions that is tied to measuring task **accomplishment**."*

Source: Table adapted by author from comparing definitions in Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 4th ed. (Newton Square, PA: Project Management Institute) and Joint Chiefs of Staff, Joint Publication (JP) 5-0, *Joint Operation Planning* (Washington, DC: Joint Chiefs of Staff, August 2011).

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[47] US Department of the Army ADRP 5-0; Joint Chiefs of Staff, JP 5-0; US Department of the Army, Army Tactics Techniques and Procedures (ATTP) 5-0.1, *Commander and Staff Officer Guide* (Washington, DC: Department of the Army, 2011); US Department of the Army, Field Manual (FM) 3-07, *Stability* (Washington, DC: Department of the Army, 2014); Dr. Jack D. Kem, *Planning for Action: Campaign Concepts and Tools* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 2013).

[48] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 444.

Both of these assessment measures provide an evaluation approach for supported objectives and desired conditions. Ends, ways, means, and risk provides an approach to achieving an end state. The challenge is to positively affect change in the process of assessing measures to achieve the end state. For example, Naidoo et al reported that although recommendations for improving health services were published, the recommendations were not yet implemented.[49] The recommendations can be considers as ways to achieve the end state, but perhaps there are no means available to support executing the ways. This may be at least one reason the recommendations are not yet implemented.

<u>Step-by-Step process to answer Research Question</u>

The step-by-step process that will be followed to seek to answer the research question will include both qualitative and quantitative methods.

The qualitative methods[50] will review available sources in the literature to assess descriptions of patterns and behaviors as an inductive process to focus on the meanings and understanding of themes. Patterns and current trends in public health planning supported from the qualitative perspective can help provide an idea of the goals and issues that are of interest or of importance. These are areas that can be assessed as what will meet the needs for public health planning support or what needs to be addressed.

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[49] Pren Naidoo, Caroline Wills, Donald A. Enarson, and Nulda Beyers, "How do we Measure the Success of Operational Research?" *Public Health Action* 4, no. 2 (June 2014): 74.

[50] A211 Notes, Dr. Martin, 23 October 2014; Bernard Beins, *Research Methods: A Tool for Life* (Boston, MA: Pearson/A&B, 2009), 101; Creswell, *Qualitative Inquiry and Research Design*.
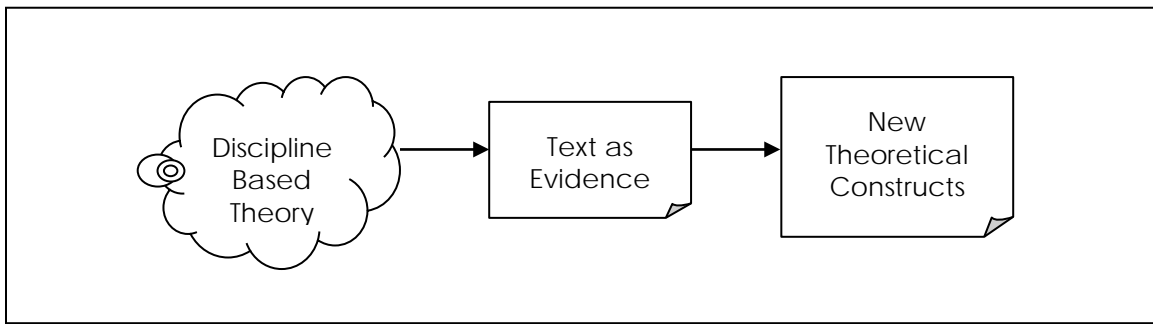
Figure 6.   Theory to Text to Theory

Source: Figure adapted by author from A211 Notes.

For example, literature reports a very high rate of tuberculosis in Ukraine and presents the challenges in economic support to counter the problem. Other literature reports the increasing movements of people because of displacement due to ongoing conflicts. Monitoring TB rates alone without considering the effects of displacement caused by war crises or conflict could result in different response measures.

Identifying relationships of variables from qualitative information that may not be directly observable can inform new theoretical constructs that may improve risk mitigation measures. Understanding the qualitative perspective of need, as are we measuring the right things, provides an evidence based method for measures of effectiveness (MOE) or validation.

The quantitative methods will review available literature and data to assess relative differences and changes over time. Health statistics are collected over time and provide a data distribution to compare different measures and different regions. The ability to generalize what is occurring in the population will inform assessment measures. The data distribution provides an evidence based method for measures of performance (MOP) or verification.

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For example, through the literature review, facts for people living with HIV in eastern Europe and central Asia reference relationships to correlations with social stigma, drug use, and tuberculosis, end-stage liver disease, and viral hepatitis C infection. These are qualitative perspectives that indicate public health planning support might consider MOEs that address where and how education and immunization mitigation measures can be implemented as a way to prevent the spread of disease. From a quantitative perspective, reported infection rates indicate that public health planning support might consider MOPs that evaluate and monitor the rates to provide a feedback, or evidence based design, review of MOEs and modify or change them as necessary. For example, steep increases mean not just more people needing antiviral therapy but increasing response requirements for communicable disease with greater incidences of associated tuberculosis.[51]

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[51] World Health Organization, "Ukraine AIDS 2012 Growing HIV Epidemic in Eastern Europe and Central Asia a Concern," 25 July 2012, accessed 6 October 2014, http://www.euro.who.int/en/health-topics/communicable-diseases/hivaids/news/news/2012/7/aids-2012-growing-hiv-epidemic-in-eastern-europe-and-central-asia-a-concern.
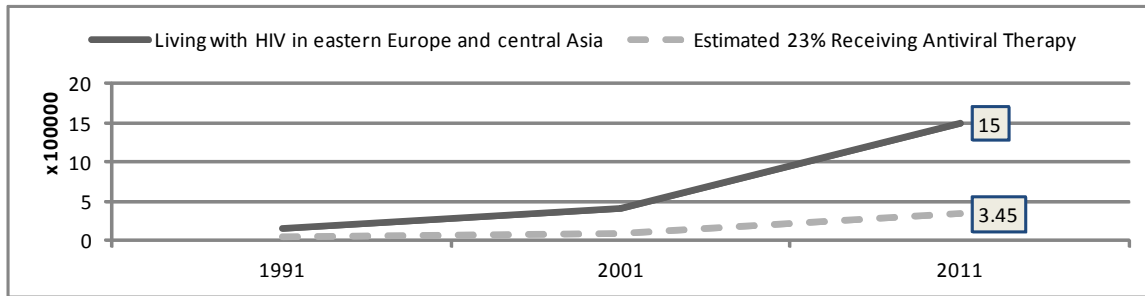
Figure 7.   HIV Epidemic Data

Source: Figure adapted by author from World Health Organization, "Ukraine AIDS 2012 Growing HIV Epidemic in Eastern Europe and Central Asia a Concern." 25 July 2012, accessed 6 October 2014, http://www.euro.who.int/en/health-topics/communicable-diseases/hivaids/news/news/2012/7/aids-2012-growing-hiv-epidemic-in-eastern-europe-and-central-asia-a-concern.

<u>Strengths and Weaknesses of</u>
<u>chosen Methodology</u>

A mixed methods approach can provide a more comprehensive view of available information. Investigating evidence from the qualitative and quantitative perspective can illustrate gaps in MOEs and MOPs. However, a mixed methods approach is more extensive and may not provide the same types of patterns. Different patterns or behavior from qualitative versus quantitative information could provide contradictory evidence.

CHAPTER 4

ANALYSIS

The case study of Ukraine's crisis in 2014 provides evidence of its capabilities of

public health planning. Public health planning support will operate at varying degrees of

operational capability, with the goal to become fully operationally capable. Yet different

scenarios with associated risk(s) will affect the sustainability at fully operational levels.

With assistance from external organizations, public health planning has a better chance to

recover from the realized risks. The following is the restated research question

investigated in this study: Considering the crisis in Ukraine in 2014 as a model, what

evidence does the model provide to planners to inform how external organizations may

be expected to fill gaps in public health support for the future? In order to answer this

question, the supporting research included identifying the metrics that help define the

state of public health planning support; the threats, challenges, or gaps in the identified

metrics of the public health support system that can occur during armed conflict; the

effect of an intersectoral nature of identified metrics on the public health planning

system; and the role external organizations can provide to support public health planning

that may internally be unsustainable during armed conflict.

Assessment of Metrics of Public Health
Planning for Ukraine

Mortality and tuberculosis data were the primary metrics assessed with regard to

public health planning in Ukraine. Water-borne diseases data was also considered as a

metric, with a review of the reported cases of cholera. Although historical data for

cholera did not show high rates in Ukraine, the nature of the 2014 conflict presents

conditions that increase the risk to the population. These metrics link to the effectiveness of public health planning.

<div align="center">Mortality Comparisons</div>

Mortality data from Europe was analyzed from 1994 to 2010 employing the database available on Eurostat, as shown in Appendix C, Europe Mortality. Eurostat provides statistical information for the European Union.[52] The average mortality rates (all causes of death) of all included countries decreased over the time period, while the variance among countries did not decrease. Figure 10 (in Appendix C) depicts the country average of causes of death which are the standardized death rate per 100,000 inhabitants for all causes of death (A00-Y89 excluding S00-T98). A00-Y89 and S00-T98 are alphanumeric codes used by Eurostat. The general mortality decrease among countries from 1994 to 2010 indicates that the public health planning in those countries had an effect on mortality rates.

The yearly average (μ) and up to three standard deviations (σ) from the yearly average were calculated from the included countries and plotted together in order to help understand which countries were within statistical process control and show bifurcated trend. The Eurostat data was clearly bifurcated with some countries above the average and some below the average rates of death. The countries generally falling below the average are not former Soviet block countries while the countries generally falling above the average are mostly eastern block countries. The countries below the average were Slovenia, Denmark, Ireland, Portugal, Malta, Greece, United Kingdom, Finland,

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[52] European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat/about/overview.

Netherlands, Germany, Belgium, Austria, Cyprus, Luxembourg, Norway, Sweden, Spain, Iceland, Italy, France, Switzerland, and Liechtenstein. The countries above the average were Bulgaria, Former Yugoslav Republic of Macedonia, Latvia, Hungary, Romania, Estonia, Lithuania, Slovakia, Croatia, Czech Republic, Poland, and Albania. Data from Ukraine was not available in this database. Bulgaria, Former Yugoslav Republic of Macedonia, Latvia, Hungary, Romania, Estonia, Lithuania, Slovakia, Croatia, Czech Republic, Poland, and Albania are all countries that are in Eastern Europe. The bifurcated difference indicates high-risk groups are found in eastern block regions.
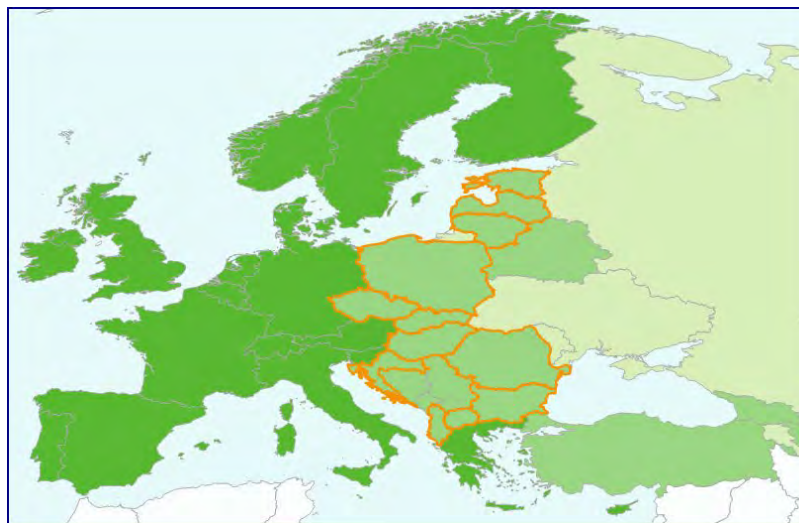
Figure 8.   Countries with Mortality above the Average from 1994 to 2010

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat/about/overview and WHO interactive chart.

Cholera Comparisons

Water-borne diseases can provide indication to the capabilities of public health planning support when surveillance demonstrates increases for a particular time period. An associated metric is reported cases of cholera. Appendix D, Cholera Comparisons, shows two primary findings from the dataset of 38 countries (WHO Region=Europe) collected from 1990 to 2013.

First, Ukraine ranked high (worse) as compared to the other 37 countries. The reported cases (n=813 in 1994) ranked second highest of the entire data set. However, the calculated rate per 100,000 population lowered that rank to fifth. That rate was 1.57 per 100,000 population in 1994.

The second finding was that the last reported date for cases of cholera was 2011 (n=33, rate=0.07 per 100,000 population); of the 24 reportable years from 1990 to 2013, Ukraine only reported cholera cases for five of those years. These findings indicate that cholera has not been shown to be endemic to Ukraine. This does not mean that there may not have been more actual cases of cholera. Simply, this shows that data was not collected on reported cases of cholera.

Data may not have been collected because there was no actual cholera in the area during those times, patients not willing or able to be seen and provide the data, providers or planners not available or able to collect the data, or other unknown reasons. Although in 1994, Ukraine reported a high number of cases of cholera, there has not been a high level of reporting since that time. However, conditions are set in eastern Ukraine to be susceptible to a cholera outbreak. Other metrics demonstrated alarming trends in Ukraine.

Tuberculosis Comparisons

Metrics of tuberculosis (TB) data provided evidence in the assessment of public health planning support in Ukraine. Comparing Ukraine to other countries of interest for TB mortality, prevalence, and incidence rates informed measures of performance of public health planning. They are shown in Appendix E, Tuberculosis Comparisons. Although some trends for Ukraine showed worse performance than other countries during the same time period, there were demonstrated improvements.

Findings for TB mortality of Eurostat's 35 European Union countries shows that both the variance and the average TB mortality rates of all included countries decreased over the time period from 1994 to 2010. Decreasing the variance indicates the process control is operating more effectively. TB mortality for Ukraine was higher on average than for the European and at the highest for selected countries in the geographical proximity of Ukraine. To understand why the rates were higher, Ukraine was compared to ten other surrounding countries from 1990 to 2013. They were Belarus, Bulgaria, Estonia, Georgia, Latvia, Lithuania, Moldova, Romania, Russian Federation, and Turkey. Ukraine resulted in the highest TB mortality rate. Moldova and the Russian Federation also showed high rates. From 2005 to 2013, Ukraine exhibited a downward trend in TB mortality. Yet incidence and prevalence rates were predominantly highest for Georgia and Moldova, with Ukraine ranking third and fourth highest respectively by 2013. The incidence of TB per 100,000 people peaked for Ukraine in 2004 and 2005 at 127. The prevalence of TB per 100,000 people for Ukraine remained consistently in the 160s from 1998 to 2007. By 2013, prevalence did decrease to 120, but was still higher than the 1990 value of 71. Ukraine showed an increase in the case detection rate, which could indicate

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better performance in surveillance. Despite gaps in reported data from 1990 to 2013, TB treatment success rate did improve from 67 percent of new cases to 71 percent of new cases. Improvements in case detection rate and treatment success rate support evidence for better performance in surveillance and response capabilities needed for effective public health planning.

<center>Metrics of Ukraine</center>

As compared to the Eurostat database, Ukraine TB mortality is higher than the top three countries (Latvia, Lithuania, and Romania) for the similar time period. From 1990 to 2013, the birth rate remained consistently lower than the death rate. The annual population growth took a marked decline from 1992 to 2003 before beginning to slowly rise from 2003 to 2013. However, as of 2013, the population growth was still negative at -0.2%. In addition to population growth below zero since 1994, net migration was reported at over -40,000 for 2012. From 1990 to 2013, net migration data was captured every five years. The 2017 net migration will likely continue a downward trend. These factors contributed to a consistent population decrease for Ukraine from over 51.6 million in 1990 to 45.2 million in 2013.

Although Ukraine population decreased, the rate of TB prevalence per 100,000 population trendline actually increased with respect to the population decrease from 1990 to 2013. However, if the trendline comparison is limited to when TB prevalence began a marked downturn in 1999, then the population trendline presents a greater slope than the trendline for TB prevalence. This indicates that public health planning measures may be effecting disease risk to the population.

Unfortunately, this was not the case for TB mortality per 100,000 population. The trend for the timeframe from 1990 to 2013 demonstrated a positive slope. Limiting trending to when TB mortality began a decline, 1995 to 2013 did result in a negative slope, but of a less magnitude than population decline. However, in comparison to 2007 WHO goals to halve TB prevalence and mortality by 2015 to 188 and 16 per 100,000 population respectively,[53] Ukraine could be on the path to meet those goals. These are the results that support the evidence of effectiveness of a particular model of public health planning at a point in time.

<div align="center">Assessment of Risks to Public Health Planning
during Armed Conflict for Ukraine</div>

The unchanging nature of risk is that it is always present, including combinations of known and unknown conditions. Chapter 2 identified risks that can occur during armed conflict creating threats, challenges, or gaps in the identified metrics of the public health planning support system. As public health planning involves a series of metrics that must be managed over time, it can be viewed in terms of a series of projects with the associated characteristics seen in project risks. Although the character of risk will vary per time and the operational environment, historical data is used as evidence to inform predictions for future modeling. The case study of the 2014 conflict of Ukraine highlights several risk factors. It is acknowledged that other risk factors may valid in considering the effects on public health planning.

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[53] World Health Organization, *Plan to stop TB in 18 High-Priority Countries in the WHO European Region, 2007-2015* (Copenhagen, Denmark: WHO Regional Office for Europe, 2007), accessed 9 March 2015, http://www.euro.who.int/__data/ assets/pdf_file/0005/68180/E91049.pdf.

Key risks to public health planning support in Ukraine include resource availability, reporting mechanisms, and security. The key risks can be considered as a continuous range or as noncontinuous. For this application, these risks will be considered as noncontinuous. For example, resources are readily available (response capability) or they are not readily available, reporting mechanisms (surveillance capability) are operating properly or they are not operating properly, and security is readily assured or it is not readily assured. These risks can be applied to public health planning response and surveillance capabilities utilizing TB metrics as a model.

The best case scenario is when security is readily assured, reporting mechanisms are operating properly, and resources are readily available. In this scenario, there is the lowest risk to providing prevention and treatment measures for the population at risk. Uncertainty intervals applied to the scenario demonstrate the effects on the metric. The greater the uncertainty, the more risk induced into the system, and the further away from the ideal scenario results can be expected. One example is funding for Ukraine's TB control program. The budget has not been consistent from 2010 to 2014. During this period, the TB control budget was reduced from approximately $200 million to $100 million; the amount domestically funded was reduced from about $135 million to $35 million, although the international community did fund an additional $35 million in 2014.[54] Yet there was not a correlating reduction in TB rates. In fact, in some cases, such as HIV positive TB patients, the rates rose during that same time period.

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[54] World Health Organization, "Ukraine Tuberculosis Profile," accessed 9 March 2015, http://www.who.int/tb/country/data/profiles/en/.

The rise in cases with other risk factors is not to be unexpected. Combining risks of less available funding for control, patients with other immune-compromised conditions, and multi-drug resistance diminishes the ability for public health personnel to control TB in Ukraine. These risks are further exacerbated by other sectors experiencing armed conflict in Ukraine.

Assessment of the interrelated nature of Sectors during Armed Conflict for Ukraine

The interrelated nature of sectors can be shown as a system of variables. Public health planning can be affected either directly or indirectly by each of these variables. Public health planning is addressed across a project life cycle. Each of the public health initiatives can be considered as projects, subject to various risks.
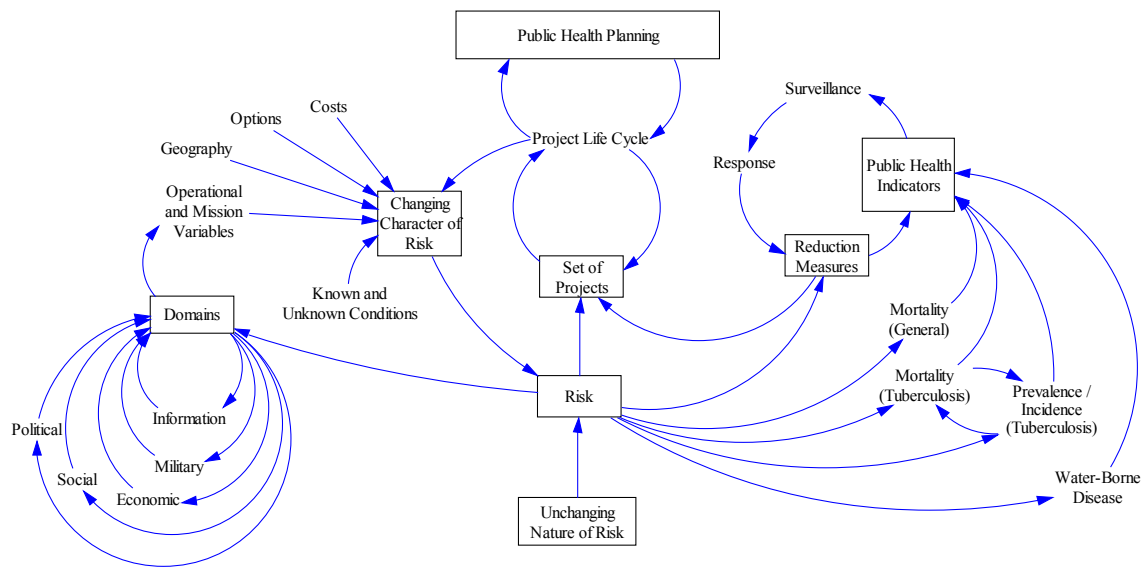
Figure 9.   Interrelated nature of Sectors

Source: Created by author.

In a stable environment, there is the ability to enforce the rule of law. In an unstable environment, other confounding variables, or intersectoral considerations, make providing support in planning of public health practically impossible. In a stable environment, when a problem arises, it can be identified (surveillance) and then can be resolved (response). In an unstable environment, even if the problem is identified, it may be impossible to resolve the problem due to the crisis. Given resources, the problem may be able to be resolved, the problem may be recoverable. There is a threshold of recoverability with levels of crisis or instability. Ideally, the host nation would be able to counter the problem. This shows the relationship between public health planning and stability.

The 2014 crisis in Ukraine presents a clear example of the interrelated nature of sectors during armed conflict. In 2013, the number of physicians per 1000 people was 3.5, with an approximate 45 million country population, or just over an estimated 159 thousand physicians in Ukraine.[55] The World Bank includes physicians, nurses and midwives, and community health workers in its database. Combining these workers together, a similar calculation would provide an estimate of almost 510 thousand health care workers in Ukraine in 2013. By August 2014, WHO reported estimates of over 4 million people affected, 400 thousand people forced from their homes, and up to 70 percent of health care workers fleeing the conflict area.[56] Assuming the area of conflict

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[55] World Development Bank, "Health Nutrition and Population Statistics," accessed 9 March 2015, http://databank.worldbank.org/data/databases.aspx.

[56] World Health Organization, "Appeals for US$ 14 Million to Scale up Health Operations in Ukraine," accessed 15 February 2015, http://www.euro.who.int/en/countries/ukraine/news/news/2014/08.

has a similar distribution of health care workers, would mean that of an estimated 2.2 thousand health care workers in the conflict area, over 1.5 thousand have fled. Other problems include being forced to flee, having limited access to safe water, closure or destruction of health care infrastructure, and inability to provide public health services, including immunizations.[57] The military and political domains of the armed conflict have had a direct result on the ability for the public health system to function as designed.

Each one of the other problems cited could similarly be assessed based upon results from the armed conflict. The United Nations High Commissioner for Refugees (UNHCR) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) track displacement due to crisis. OCHA shows the relationships between the funding requirements for several sectors. They include emergency shelter, food, health, water, livelihood, protection, education, coordination support, and logistics.[58] OCHA shows health and nutrition have only been funded for 3 percent of the submitted requirements of $50 million; water, education, and logistics are at 0 percent funded for requirements totaling $48 million, $20 million, and $2 million respectively.[59] Without economic funding to support the requirements for the recovery plans, the ability for the public health system to respond is limited.

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[57] Ibid.

[58] United Nations Office for the Coordination of Humanitarian Affairs, "Ukraine: Humanitarian Response Plan Funding," accessed 19 May 2015, http://reliefweb.int/ sites/reliefweb.int/files/resources/ukraine-humanitarian_funding_update-_19_may_2015.pdf.

[59] Ibid.

The counters to these problems are needed. These organizations, along with WHO

and others who help monitor data, like the World Bank, provide information and options

for external support to public health planning in Ukraine. Other external organizations are

needed because in the 2014 crisis, Ukraine does not have the stability that is conducive to

effective public health planning or response.

<p style="text-align:center">Assessment of External Organization
Support for Ukraine</p>

Many organizations work to provide external support when a nation is in crisis.

Ukraine's external support includes organizations such as WHO, UNHCR, OCHA, and

the US European Command (EUCOM). Yet this is not an exhaustive list. OCHA reports

over 35 external organizations providing support in the various provinces of Ukraine.[60]

Other governments as well as non-governmental organizations demonstrate their

commitment to Ukraine in order to work towards peace and stability in the region.

The 1999 Stability Pact for South Eastern Europe was established to aid the

conflict prevention and reconstruction process.[61] Members understood that key to

reconstruction was public health and this area of support was included in Dubrovnik

Pledge of 2001. It was a joint action plan to promote regional cooperation through public

health projects and policy initiatives, and included themes of surveillance and response in

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[60] United Nations Office for the Coordination of Humanitarian Affairs, "Ukraine: Who does What Where–Health," accessed 28 August 2014, http://www.who.int/entity/hac/crises/ukr/ukraine_3w_28august2014.pdf?ua=1.

[61] Gerald Rockenschaub, Jukka Pukkila, and Maria Cristina Profili, eds., *Toward Health Security: A discussion paper on recent health crises in the WHO European Region* (Copenhagen, Denmark: WHO Regional Office for Europe, 2007), 39.

public health planning. By demonstrating solidarity, the group works to counter problems from many sectors.

The US provides a host of resources for Ukraine, including rations, medical supplies, and EUCOM medical and security assistance advisory teams.[62] Economic and materiel support are important, but the ability to provide security in order to deliver needed resources supporting public health systems is even more critical. This is an advantage that US commitment through military operations can provide. Through Operation Atlantic Resolve (OAR) and the European Reassurance Initiative (ERI), the US Congress has funded a series of EUCOM exercises and training for land, sea, and air as well as specific support to Ukraine. EUCOM reports from over the last year show that five of the exercises included the Ukraine; they are: Exercise Saber Guardian 14, Exercise Rapid Trident 14, Exercise Saber Junction 14, Exercise Steadfast Javelin II, and Exercise Sea Breeze.[63] The United States participates in many military exercises each year in order to ensure military readiness, improve interoperability with other allies, and build relationships with partner nations. These are some of the key themes of OAR. As part of these themes, the considerations for public health planning support include foreign

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[62] US European Command, "Operation Atlantic Resolve," Communication and Engagement Directorate Fact Sheet, 26 June 2014, 1-6; US European Command, "Operation Atlantic Resolve (2014)," Communication and Engagement Directorate Fact Sheet, 29 January 2015, 1-12; US European Command, "Operation Atlantic Resolve (January 2015)," Communication and Engagement Directorate Fact Sheet, 29 January 2015, 1-4; US European Command, "Operation Atlantic Resolve (March 2015)," Communication and Engagement Directorate Fact Sheet, 11 March 2015, 1-5; US European Command, "Operation Atlantic Resolve (May 2015)," Communication and Engagement Directorate Fact Sheet, 1 May 2015, 1-6, accessed 24 January 2015, http://www.defense.gov/home/features/2014/0514_atlanticresolve/.

[63] Ibid.

humanitarian assistance operations, peace support operations, and non-combatant evacuation response operations.

<center>Summary</center>

The 2014 crisis in Ukraine serves as a model to inform public health planners what external support is required during armed conflict. Risks to surveillance and response capabilities are worsened by various interrelated sectors including weak political and economic conditions and destruction caused by the conflict. Destruction includes healthcare infrastructure, medical supplies, and immunizations. The conflict has resulted in health care workers fleeing Ukraine and increased numbers of people migrating out of the dangerous area. Metrics, such as improving TB rates, are already tenuous. National public health planning efforts to address metrics like these often do not follow a consistent programming pattern, but instead are only sometimes funded. The intersection of each of these factors creates a complex problem for public health planners. External organizations appear to affect change at varying levels, and some are more effective than others.

The ability to most effectively respond is a function of interrelated factors, of which the ability to provide support for security and stability is critical. Stability allows the ability to implement order in chaotic conditions. Without stability, it is difficult to effectively treat or provide public health planning support. Sustainable and realistic strategies are needed to effectively be applied in an unstable environment. The strategies must be realistic and feasible, acceptable, and suitable in order to safely and effectively affect change. The US is one of the key players that can work to affect change. The US

has the ability to provide enabling support through military operations, technical expertise, and resourcing.

CHAPTER 5

CONCLUSIONS

The purpose of this case study is to contribute to the body of knowledge for the realistic expectations of public health planning response capacity of a nation experiencing armed conflict. Assessing the publicly available qualitative and quantitative information helps to reduce the gaps in understanding this type of operational environment. Better understanding of the operational environment helps external organizations better prepare to aid in public health planning response during crisis. These conclusions can help US military organizations to tailor security and stability commitments in the region through military operations and exercises to address critical public health planning problems.

Interpretation of the Analysis

Historical data showed that metrics from Ukraine, such as mortality rates and TB rates, have been worse over time than Western European counterparts. Continued surveillance of key metrics is a mission essential task for public health planners. Mortality, TB rates, and cholera rates are a few of the many metrics that is likely to severely worsen during armed conflict. Some metrics, such as cholera rates, face challenges in being successfully monitored because of the typical character of underreporting. Yet, as demonstrated in Haiti in 2010, this water-borne disease can increase mortality in epidemic proportions during a crisis. During armed conflict when there is destruction, poor sanitation, increased population densities, and minimal access to clean water, the short-incubation periods create a disease cycle that is at increased risk for public health planners to manage.

Risks to public health planning during armed conflict seem to come from every sector. Militaries are concerned with offensive and defensive operations, budgets are prioritized for arms and ammunition, political leadership is weakened, the ministry of health experiences turnover in organizational leadership, and logistical lines of communication are compromised. These each pose threats to the identified metrics of effective public health planning. Ukraine's health system is based on the former Soviet "Semashko" model, which is a risk to public health planning in itself because of its centralized nature. What western society understands as "just in time" logistics is not consistent with the former Soviet "Semashko" model; public health planning in Ukraine relies on support from external organizations.

Support comes from external organizations in the region, the European area, and the international community. Organizations like WHO, UNHCR, OCHA, the World Bank and many others work to support public health planning through a range of surveillance and response measures. Internationally, governments can sponsor external support, such as US military operations. Military and exercises present an opportunity to reduce risks in public health planning. The key to external government's partnership with Ukraine through military operations, training, and exercises is the ability to influence security and stability in the region.

<u>Areas for Further Study</u>

A study of the theory of real options applied as a mitigating strategy of public health planning risks during armed conflict is a recommended area for further study.[64] As

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[64] Lenos Trigeorgis, *Real Options: Managerial Flexibility and Strategy in Resource Allocation* (Cambridge, MA, The MIT Press, 1996), 1-4, 9-14, 57, 227.

public health planning can be considered a portfolio of projects and programs, such as the

WHO Global TB Program, and each project requires sets of resources, then a real options

study would help evaluate flexibility potential in managing the portfolio. Real options

include decisions with respect to time, space, and function. Deferring, minimizing,

maximizing, eliminating, or changing provides strategic flexibility in courses of action.

The US and Ukraine share the challenges of economic limitations. This includes the US

budget to provide external support to Ukraine. As Nicholson reported in 2014,

correlations for improvements in health metrics in Afghanistan were not realized despite

a $90 billion investment.[65] America must do better than this. The health and prosperity of

our global community relies upon it. Future research has an obligation inform strategic

public health planning decision making based upon evidence.

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[65] James A Nicholson, "Optimal Interventions in Host-Nation Health Systems during Counterinsurgency Operations" (Master's thesis, US Army Command and General Staff College, Fort Leavenworth, KS, 2014), 67.

GLOSSARY

Intersectoral. Relationships between different sectors of the operational environment that provide interrelated effects.

Public health planning. Evidence-informed planning for the health of people and their environments.

APPENDIX A

PUBLIC HEALTH THEMES

Support for public health planning includes domains for people and their

environments. This table compares the environmental and human themes of public health

for different organizations. Common themes for each of the following organizations

include surveillance and response in the domain of public health.

Organization	Focus of Public Health	Surveillance Theme	Response Theme
American Planning Association	active living, emergency **preparedness**, environmental exposures, food and nutrition, health and human **services**, and social cohesion and mental health[66]	✓	✓
American Public Health Association	climate change, Ebola, environmental public health, health equity, health **reform**, healthiest nation in one generation, global health, gun violence, healthy communities, injury and violence **prevention**, school-based health care, tobacco, transportation, and vaccines[67]	✓	✓
European Commission	steering EU public health, ensuring health security, improving health systems, risk assessment, taking **action** against diseases, health in society, fostering good health, **indicators**	✓	✓

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[66] Anna Ricklin et al. *Healthy Planning: An Evaluation of Comprehensive and Sustainability Plans Addressing Public Health* (Chicago: American Planning Association, 2012), 12-18.

[67] American Public Health Association, "All Topics and Issues," accessed 11 April 2015, http://www.apha.org/topics-and-issues/all-topics-and-issues.

Organization	Focus of Public Health	Surveillance Theme	Response Theme
	and data, pharmaceuticals, medical devices, and endocrine disruptors[68]		
US Army Public Health Command	animal medicine, deployment and environmental health, diseases and conditions, emergency preparedness and **response**, food and drinking water protection, health **surveillance** and education, healthy living, laboratory services and toxicology, region-specific information, and workplace safety and health[69]	✓	✓
World Health Organization	Various health topics, data collection, media center (public relations external management), publications, country data, various programs, governance (internal management)[70] with a public health focus on **surveillance**, risk reduction, **response**, and containment[71]	✓	✓

Source: Created by author.

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[68] European Commission, "Public Health," accessed 11 April 2015, http://ec.europa.eu/health/index_en.htm.

[69] US Army Public Health Command, "Topics and Services," accessed 11 April 2015, http://phc.amedd.army.mil/TOPICS/Pages/default.aspx.

[70] World Health Organization, "Databases and News Updates," last accessed 5 June 2015, http://www.who.int/en/.

[71] World Health Organization, "Alert, Response, and Capacity Building under the International Health Regulations (IHR)," accessed 11 April 2015, http://www.who.int/ihr/public_health_concerns/en/.

APPENDIX B

REGIONAL LIST OF COUNTRIES

The WHO defines a list of countries of the world into six regions: African,

Region of the Americas, South-East Asia, European, Eastern Mediterranean, and Western

Pacific.[72] The US Census Bureau defines a list of countries of the world into six regions:

Africa, Asia, Europe, Latin America and the Caribbean, Northern America, and

Oceana.[73] They are not the same as defined by WHO. Eurostat included the following list

of countries in data available.[74] A comparison of the European areas for each of these

organizations shows different countries of inclusion. This can make it difficult to make

comparisons of mortality, cholera rates, and tuberculosis rates.

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[72] World Health Organization Regions for Global Burdens of Disease, accessed
15 April 2015, http://www.who.int/entity/healthinfo/global_burden_disease/
GHE_DthWHOReg6_2000_2012.xls?ua=1.

[73] US Census Bureau, "International Data Base," accessed 11 April 2015,
http://www.census.gov/population/international/data/idb/.

[74] European Union, "Eurostat Database," accessed 31 January 2015,
http://ec.europa.eu/eurostat/.

World Health Organization	US Census Bureau	Eurostat
• Albania • Andorra • Armenia • Austria • Azerbaijan • Belarus • Belgium • Bosnia and Herzegovina • Bulgaria • Croatia • Cyprus • Czech Republic • Denmark • Estonia • Finland • France	• Albania • Andorra • Austria • Belarus • Belgium • Bosnia and Herzegovina • Bulgaria • Croatia • Czech Republic • Denmark • Estonia • Faroe Islands • Finland • France	• Albania • Austria • Belgium • Bulgaria • Croatia • Cyprus • Czech Republic • Denmark • Estonia • Finland • Former Yugoslav Republic of Macedonia, the • France • France (metropolitan)
World Health Organization	US Census Bureau	Eurostat
• Georgia • Germany • Greece • Hungary • Iceland • Ireland • Israel • Italy • Kazakhstan • Kyrgyzstan • Latvia • Lithuania • Luxembourg Malta • Monaco • Montenegro • Netherlands • Norway • Poland • Portugal • Republic of Moldova • Romania • Russian Federation • San Marino	• Germany • Gibraltar • Greece • Guernsey • Hungary • Iceland • Ireland • Isle of Man • Italy • Jersey • Kosovo • Latvia • Liechtenstein • Lithuania • Luxembourg • Macedonia • Malta • Moldova • Monaco • Montenegro • Netherlands • Norway • Poland • Portugal	• Germany • Greece • Hungary • Iceland • Ireland • Italy • Latvia • Liechtenstein • Lithuania • Luxembourg • Malta • Netherlands • Norway • Poland • Portugal • Romania • Slovakia • Slovenia • Spain • Sweden • Switzerland • United Kingdom

• Serbia • Slovakia • Slovenia • Spain • Sweden • Switzerland • Tajikistan • The former Yugoslav Republic of Macedonia • Turkey • Turkmenistan • Ukraine • United Kingdom • Uzbekistan	• Romania • Russia • San Marino • Serbia • Slovakia • Slovenia • Spain • Sweden • Switzerland • Ukraine • United Kingdom	

Source: Created by author.

EUROPE MORTALITY

Eurostat data included the standardized death rate per 100,000 inhabitants for all causes of death (A00-Y89 excluding S00-T98). The yearly average (μ) and up to three standard deviations (σ) from the yearly average were calculated from the included countries.

TIME	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bulgaria		2034.4	2114.6	2293.5	2213.4	2016.3	2041.5	1943.3	1941	1917.9	1846.6	1861.4	1817.5	1789.5	1728.7
Former Yugoslav Republic of Macedonia, the						1895	1904.9	1798.5	1913.5	1944.8	1889.9	1895.6	1831.7	1907.2	1805.9
Latvia			1985	1951.2	1976.3	1901.5	1866.4	1908.3	1882.3	1883.9	1852.3	1877.5	1864	1845.7	1707.2
Hungary	2040.6	2001.8	1973.2	1905.8	1908	1922.2	1794.6	1737.6	1742.6	1774	1792	1715.5	1625.8	1615.5	1557
Romania						1972	1864.5	1869.8	1935.5	1875.8	1789.9	1783.3	1715.6	1631.8	1601.2
Estonia	2192.3	2076.6	1922.5	1864.8	1951.3	1844.8	1819	1814.9	1790.4	1766.1	1790.8	1661.6	1623.9	1584.8	1493.4
Lithuania	1932	1890	1809.6	1750.4	1727.5	1691	1648.7	1705.2	1709.4	1679.2	1682.2	1737.2	1741.3	1737.5	1655.3
Slovakia			1751	1763.2	1776	1720.2	1734.2	1723.2	1697.8	1710.9	1683.4	1687.9	1636.6	1606.6	1551.2
Croatia									1664.7	1728.8	1589.3	1614.1	1520.2	1550.3	1499.1
Czech Republic	1820.3	1810.6	1710.7	1695.6	1638	1622.2	1682.3	1583.3	1585.8	1630.6	1540.9	1518.9	1425.9	1381.1	1343.3
Poland	1831.2	1804.5	1793.5			1697.7	1619.1	1576.8	1539.3	1548.8	1500.4	1481.5	1427.8	1427.3	1398.6
Albania											1511.8				
Slovenia	1620.8	1561.8	1512.8	1526.6	1506.1	1461.2	1406.1	1374.8	1378.3	1414.6	1205.7	1310.4	1208.5	1193.2	1135.8
Denmark	1489.7	1533	1472.1	1435.9	1383.2	1388.9	1343.7	1344.2	1356.1	1325.2	1273.8	1240.8	1234.8	1220.6	1185
Ireland	1582.8	1598.3	1551.8	1515.7	1495.6	1532.5	1445.8	1264.7	1319.6	1279	1221.8	1177.1	1163.9	1176.2	1089.9
Portugal	1475.6	1497.6	1506.2	1437	1423.3	1415	1335.7	1291.8	1256.8	1302	1198.4	1249.6	1146.5	1126.8	1121.7
Malta	1437	1373.6	1336.4	1267.5	1428.9	1428.4	1316.4	1256.8	1259.1	1291	1180.7	1185.6	1185	1098.8	1105.6
Greece	1325.1	1335	1226	1297.5	1325.3	1315.8	1229.4	1283.3	1283.2	1287.5	1264.9	1215.6	1174.7	1184.1	1128.7
United Kingdom	1367.9	1393.7	1357.9	1338.4	1326.5	1220.9	1259.8	1237.4	1236	1237.3	1169.1	1148.4	1106.1	1091.6	1083.6
Finland	1368.3	1381.4	1253.4	1328.1	1305.6	1290.5	1268.7	1225.4	1229.6	1197	1135.6	1106.7	1083.8	1076.7	1049.2
Netherlands	1316.6	1318.5	1317.3	1283.1	1281	1290.4	1271.3	1250.8	1251.3	1233.1	1165.2	1142.6	1109	1063.5	1054.3
Germany	1282.3	1358.5	1240.8	1295.2	1272.8	1245.7	1212.7	1184	1198	1212.6	1144.6	1133.4	1087.4	1065.8	1064.2
Belgium	1234	1228.2	1205.9	1286.1	1280.7	1267.9				1245.3	1168.4	1160.5	1092.3	1074	1069.6
Austria	1360.6	1348.8	1331.4	1300.5	1271.6	1253.8	1212.8	1167.6	1184.2	1200.7	1136.9	1119.3	1073	1045.1	1023.3
Cyprus						1355	1240	1173.8	1229	1237.6	1189.7	1226	1137.8	1133.7	1061.6
Luxembourg	1325.1	1282.3	1303.7	1265	1235.7	1178.3	1184.7	1183.4	1165.2	1275.9	1093.8	1086.4	1094.4	1089.5	991.8
Norway	1283.9	1302.9	1249	1255.4	1227.9	1242	1197.8	1184.6	1186.6	1124.8	1074.5	1057.6	1039.4	1044	1024.6
Sweden	1181.6	1191.6	1176.5	1158.5	1149.1	1155.9	1126.8	1117.6	1123.2	1090.1	1056.7	1049.8	1026.7	1019.2	1004.9
Spain	1194.7	1194.5	1185.7	1155.5	1166.4	1172.8	1109.5	1086.9	1089.7	1111.4	1045.4	1059.6	983	985.5	956.1
Iceland	1143.5	1183.4	1227.9	1169.4	1148.4	1180.1	1101.5	1014.7	1042.8	1039.5	1002.1	984.2	988.2	974.7	981
Italy	1240.1	1208.9	1170.7	1161.5	1167.4	1124.4	1093.3	1062.2	1051.1	1092.6			968.2	953.5	939.5
France (metropolitan)	1154.8	1165.7	1157.6	1130.1	1123.2	1111.8	1080.8	1070.9	1072.4	1100.7	996.9	1002.6	944.2	922.1	915.9
Switzerland	1146.3	1155.3	1127.9	1118.6	1099.8	1084.5	1068.1	1024	1013.2	1023	960.9	956	920.1	909.4	889.8
France								1072.7	1074	1101.2	998	1004.2	946.1	923.3	917.3
Liechtenstein															
Yearly Average	1461.084	1474.381	1477.611	1446.3	1437.759	1455.119	1416.637	1375.242	1388.466	1390.152	1234.321	1326.309	1271.073	1254.503	1216.191
μ + 1σ	1751.66	1662.526	1652.068	1594.411	1579.508	1615.488	1579.837	1528.622	1535.898	1537.527	1493.218	1467.943	1403.937	1383.413	1337.803
μ - 1σ	1170.508	1186.296	1188.307	1143.894	1134.886	1165.5	1123.156	1078.878	1088.692	1097.124	1041.461	1021.982	971.0213	951.9123	938.1247
μ + 2σ	2042.236	2050.551	2056.218	2051.111	2043.505	2034.368	2003.598	1967.97	1968.013	1976.186	1920.041	1934.965	1871.176	1858.684	1772.303
μ + 3σ	2332.812	2338.637	2345.521	2353.517	2346.378	2323.978	2297.079	2264.333	2287.787	2269.203	2212.901	2239.292	2171.227	2162.275	2050.359

Source: Table adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat/data/database.

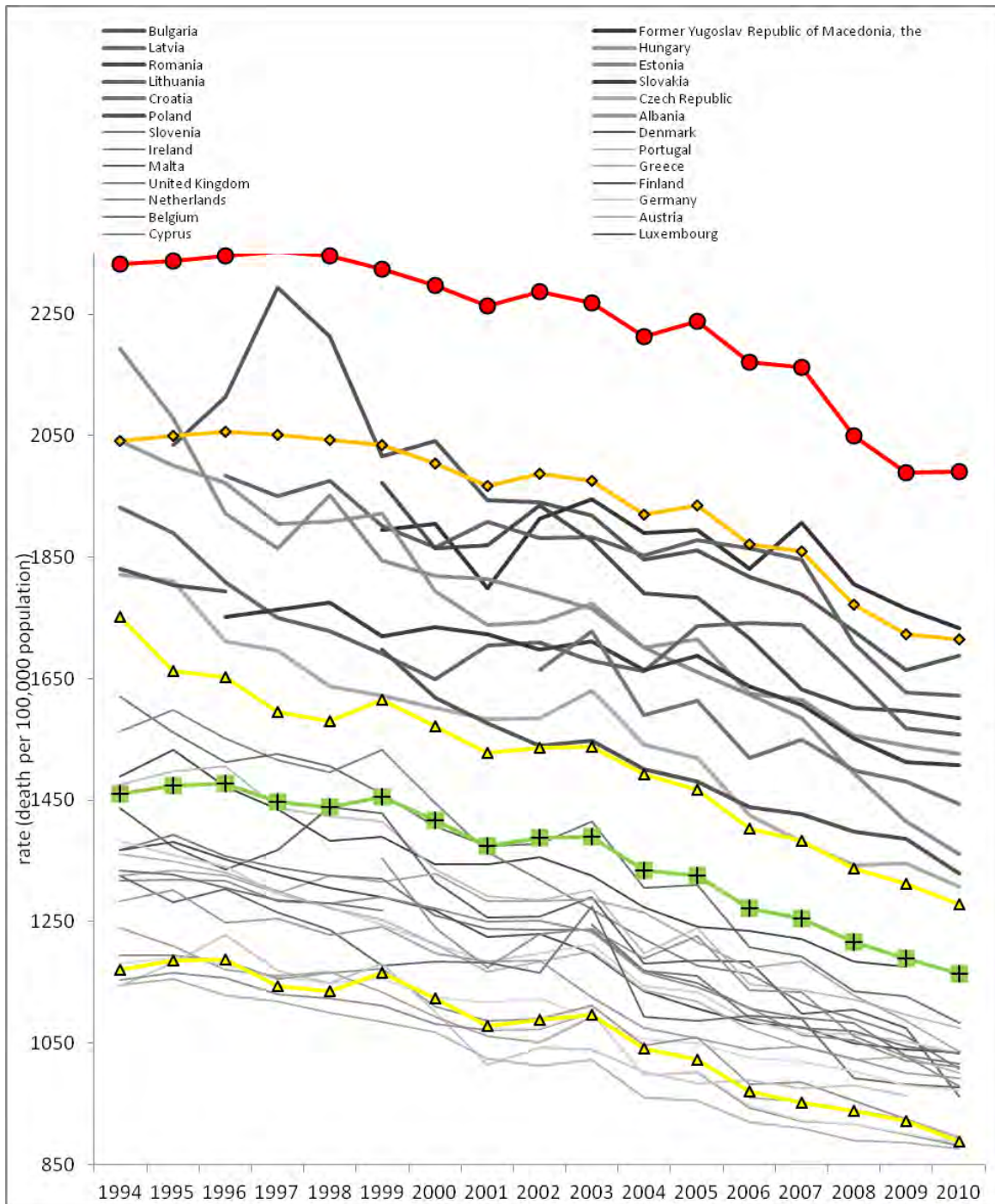Average Death Rate by Standard Deviation

Figure 10. Bifurcated Trend of Mortality Data (All Causes of Death) from Europe

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat.

Below the Average Death Rates

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat.
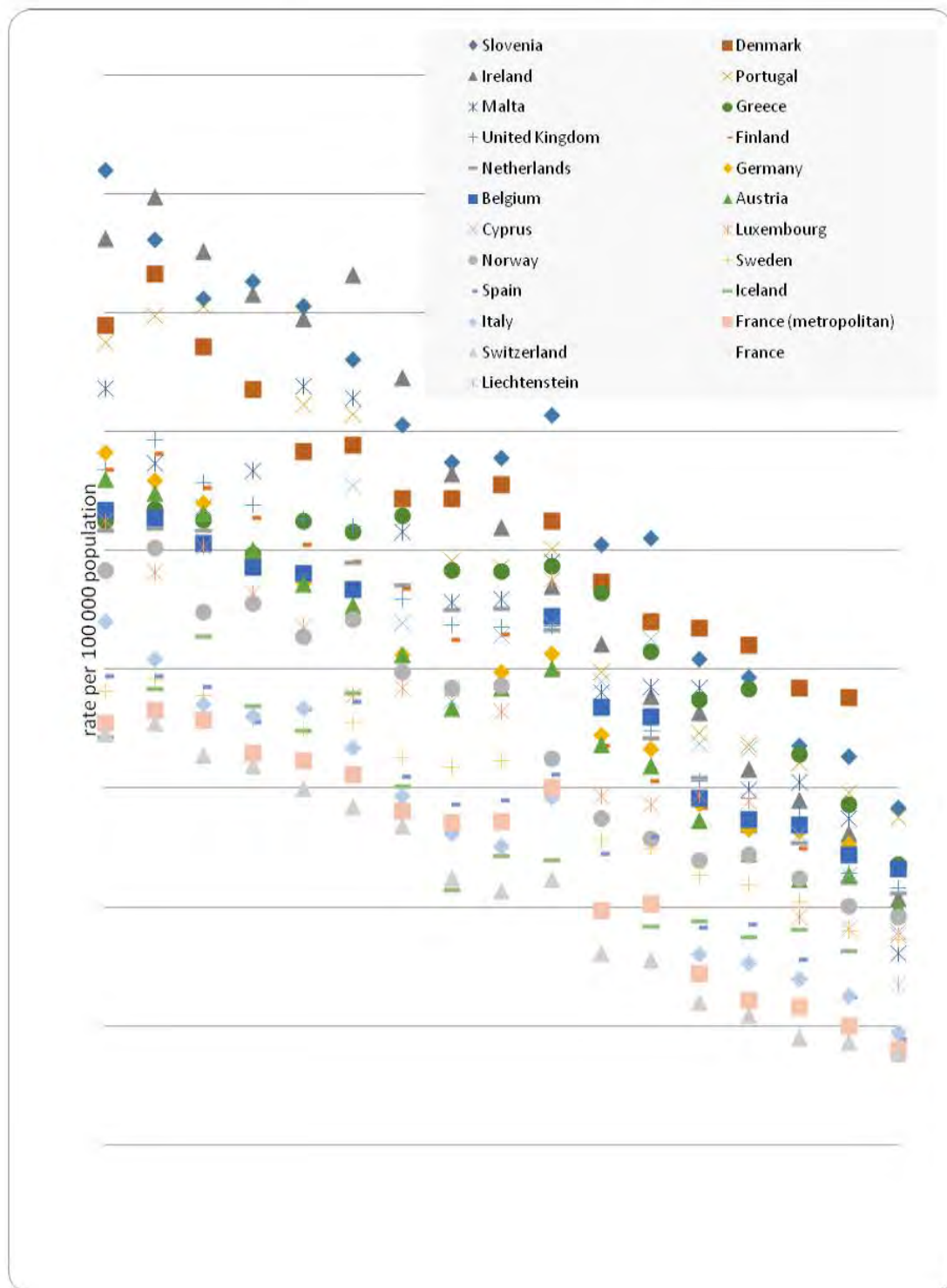
Above the Average Death Rates

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat.
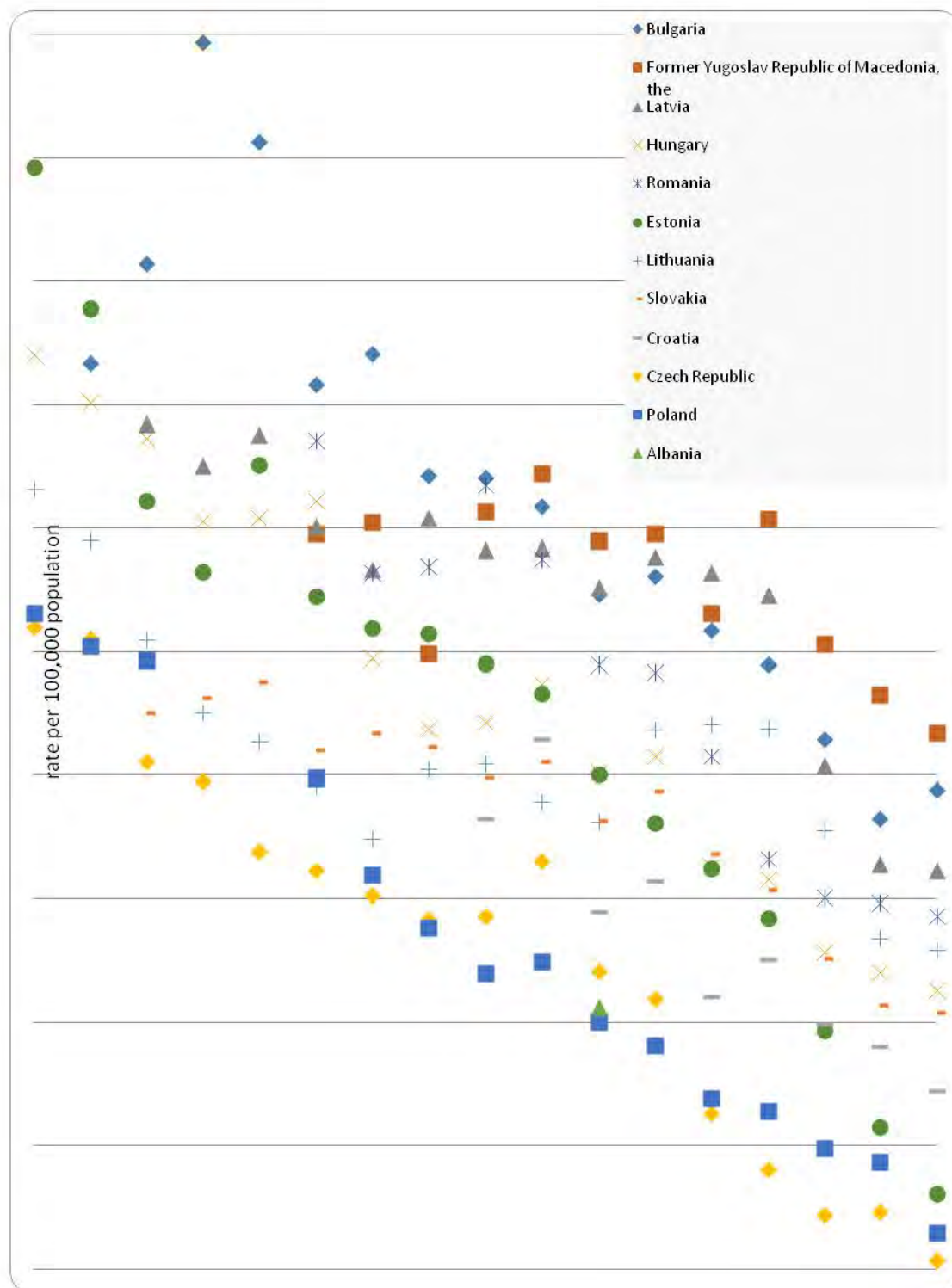
APPENDIX D

CHOLERA COMPARISONS

The number of cases of cholera reported to WHO were divided by the population

data from the international database of the US Census Bureau to calculate the incidence

per 100,000 population.[75] Determining a rate provides a comparable assessment of

cholera over time and country.

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[75] World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/node.main.175?lang=en; US Census Bureau, "International Data Base: Demographic Overview," accessed 11 April 2015, http://www.census.gov/population/international/data/idb/region.php?N=%20Results%20 &T=13&A=both&RT=0&Y=2015&R=110,120,130,140,150,160&C=.
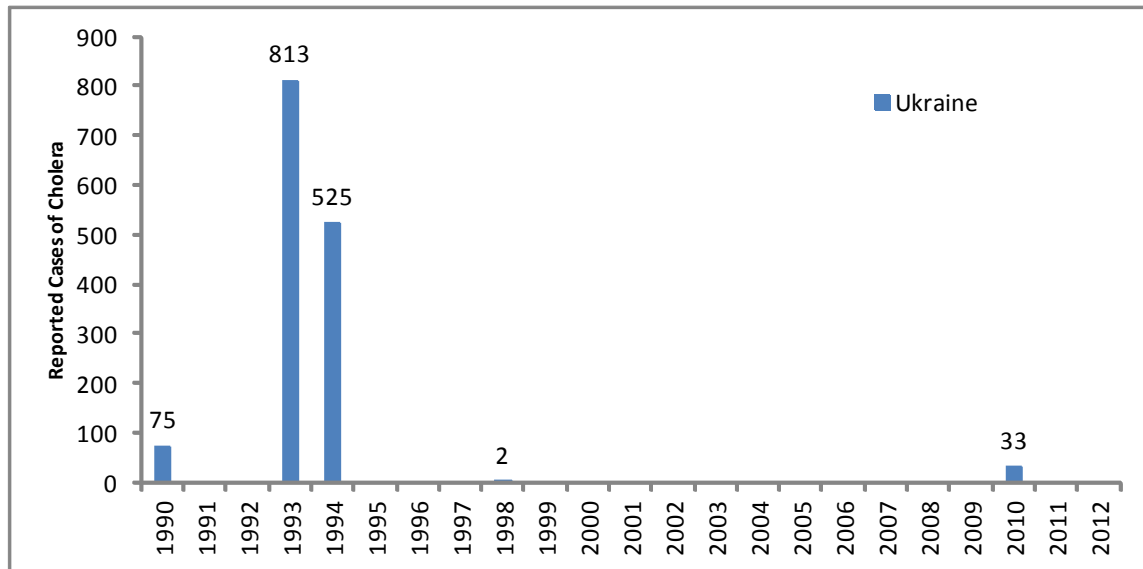
Cholera Reported Cases

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Albania					626																			
Armenia									25															
Austria	2			1	1		1		1	1			1			1								
Azerbaijan					18																			
Belarus					3	3																		
Belgium				1	1	1									1	2								
Czech Republic													2											
Denmark	1			2	2	3									1				1					
Estonia				2																				
Finland					2	1			1							1				1				
France	6	7		5	4	6	8	3	2		5	2	1					2	4	2	1		1	
Georgia				8																				
Germany	1		1	1	5	1			2	5	3	2	1	1	1	3	1	2				4	4	
Greece				1																				
Hungary								1																
Ireland												1												
Israel																								1
Italy				12	1				2								1	1						1
Kazakhstan				74	3	16		4					1						1					
Kyrgyzstan					4																			
Netherlands	3			3	1	9	3	2	4	2	1			1	1	1	4	3		5				
Norway						1				2						1	1	1						
Poland					1											1								
Portugal					1	1																		
Republic of Moldova				1	8	240																		
Romania	270	226	3	15	80	118																		
Russian Federation	49	78	6	23	1048	9	4	11	10	8	53				1		1	1			3		1	
Slovenia																								
Spain	11	1		3		6	1						1	1			2	2	5					
Sweden			1		1	2	1								1	1	1					1		
Switzerland			1	2		2			2								1							
Tajikistan				165	10																			
The former state					2																			
Turkey																								
Turkmenistan					1			55				561	30											
Ukraine		75			813	525					2											33		
United Kingdom	6	8	5	13	18	10	13	6	18		33			9	13		49	32	8	16	8	32	17	6
Uzbekistan					1																			

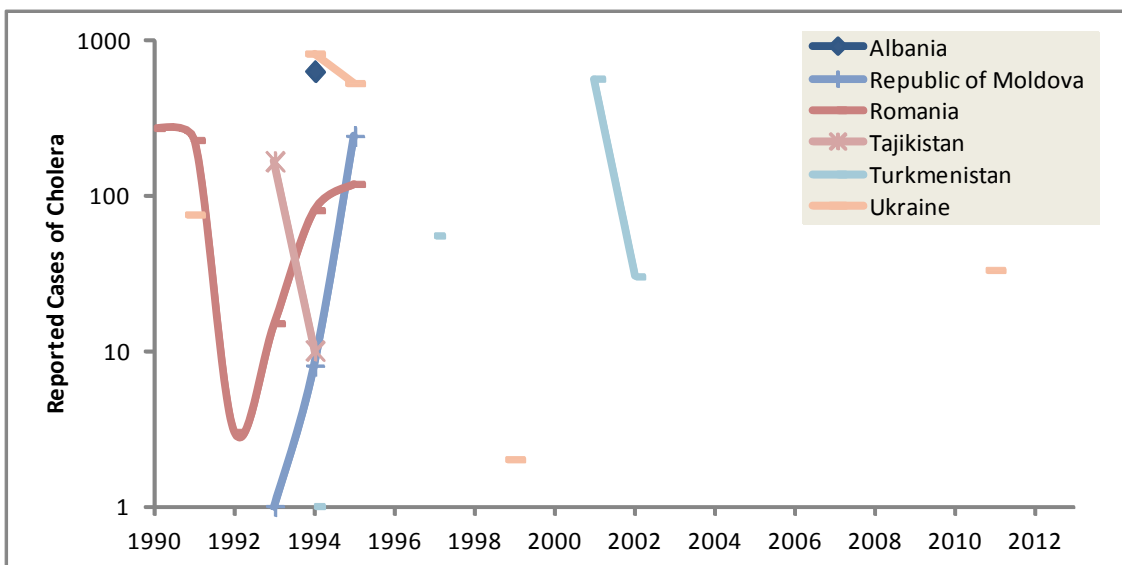*Source*: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/node.main.175?lang=en.

Cholera Incidence per 100,000 Population

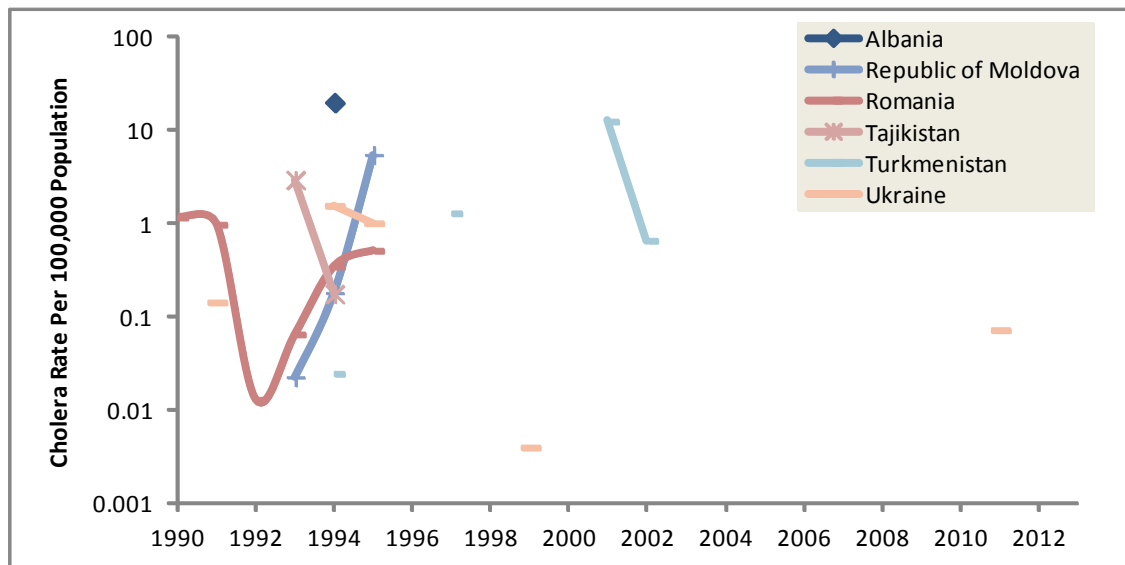|	Cholera Rate Per 100,000 Population																							
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Albania	0	0	0	0	20.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Armenia	0	0	0	0	0	0	0	0	0.805	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austria	0.026	0	0	0.013	0.012	0	0.012	0	0.012	0.012	0	0.012	0	0	0.012	0	0	0	0	0	0	0	0	0
Azerbaijan	0	0	0	0.226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belarus	0	0	0	0	0.029	0.029	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	0	0.01	0.01	0.01	0	0	0	0	0	0	0	0	0	0.01	0.019	0	0	0	0	0	0	0	0
Czech Republic	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0.019	0	0	0.039	0.038	0.057	0	0	0	0	0	0	0	0	0.018	0	0	0.018	0	0	0	0	0	0
Estonia	0	0	0	0.134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0.039	0.02	0	0	0.019	0	0	0	0	0	0	0	0.019	0	0.019	0	0	0	0	0	0
France	0.01	0.012	0	0.008	0.007	0.01	0.013	0.005	0.003	0	0.008	0.003	0.002	0	0	0.003	0.006	0.003	0.002	0	0.002	0	0	0
Georgia	0	0	0.152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Germany	0.001	0	0.001	0.001	0.006	0.001	0	0.002	0.006	0.004	0.002	0.001	0.001	0.001	0.004	0.001	0.002	0	0	0.005	0.005	0	0	0
Greece	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0.026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Israel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.013
Italy	0	0	0	0.021	0.002	0	0	0	0.003	0	0	0	0	0	0	0.002	0.002	0	0	0	0	0	0	0.002
Kazakhstan	0	0	0	0.438	0.018	0.098	0	0.025	0	0	0	0.006	0	0	0	0	0.006	0	0	0	0	0	0	0
Kyrgyzstan	0	0	0	0	0.087	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0.02	0	0	0.02	0.006	0.058	0.019	0.013	0.025	0.013	0.006	0	0.006	0.006	0.006	0.025	0.018	0	0	0.03	0	0	0	0
Norway	0	0	0	0	0	0.023	0	0	0.045	0	0	0	0	0	0	0.022	0.021	0.021	0	0	0	0	0	0
Poland	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0
Portugal	0	0	0	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Republic of Moldova	0	0	0	0.023	0.183	5.511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	1.181	0.99	0.013	0.066	0.352	0.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Russian Federation	0.033	0.053	0.004	0.015	0.705	0.006	0.003	0.007	0.007	0.005	0.036	0	0	7E-04	0	7E-04	7E-04	0	0	0.002	0	7E-04	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0.028	0.003	0	0.008	0.003	0.015	0.003	0	0	0	0	0.002	0.002	0	0	0.005	0.004	0.011	0	0	0	0	0	0
Sweden	0	0	0.011	0	0.011	0.023	0.011	0	0	0	0	0.011	0.011	0	0.011	0	0	0	0.011	0	0	0	0	0
Switzerland	0	0	0.014	0.028	0	0.028	0	0	0.028	0	0	0	0	0	0	0.013	0	0	0	0	0	0	0	0
Tajikistan	0	0	0	2.975	0.178	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The former state	0	0	0	0.306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkmenistan	0	0	0	0.025	0	0	1.309	0	0	0	12.62	0.666	0	0	0	0	0	0	0	0	0	0	0	0
Ukraine	0	0.145	0	0	1.574	1.024	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0.073	0	0	0
United Kingdom of	0.01	0.014	0.009	0.022	0.031	0.017	0.022	0.01	0.031	0	0.056	0	0	0.015	0.022	0	0.081	0.052	0.013	0.026	0.013	0.051	0.027	0.009
Uzbekistan	0	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/node.main.175?lang=en; US Census Bureau, "International Data Base: Demographic Overview," accessed 11 April 2015, http://www.census.gov/population/international/data/idb/region.php?N=%20Results%20&T=13&A=both&RT=0&Y=2015&R=110,120,130,140,150,160&C=.

Source: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/ node.main.175?lang=en.

Source: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/ node.main.175?lang=en.

Source: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/ node.main.175?lang=en, using US Census Bureau, "International Data Base: Demographic Overview," accessed 11 April 2015, http://www.census.gov/population/ international/data/idb/region.php?N=%20Results%20&T=13&A=both&RT=0&Y=2015 &R=110,120,130,140,150,160&C=.

APPENDIX E

TUBERCULOSIS COMPARISONS

TB Mortality per 100,000 population

The yearly average and three standard deviations are shown as plotted from the

Eurostat database of tuberculosis (TB) mortality per 100,000 population from 1994 to

2010 for 35 European Union countries.
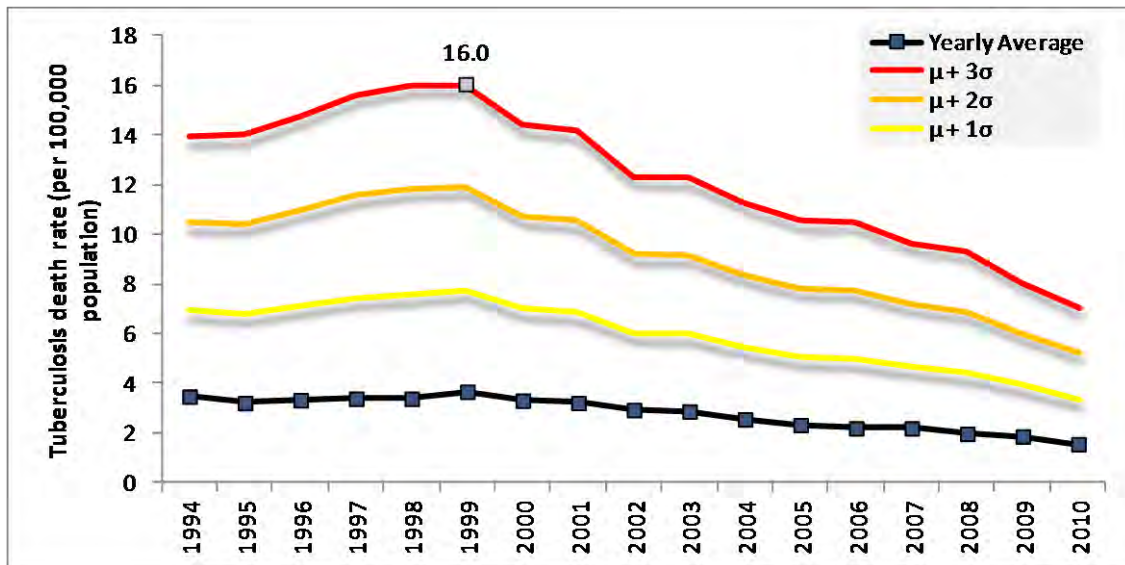
Figure 11. Tuberculosis Mortality in European Union

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January
2015, http://ec.europa.eu/eurostat.

Top rates above the average from 1994 to 2010 are for Latvia, Lithuania, and

Romania (consistently between two and three standard deviations above average);

Estonia (consistently between one and two standard deviations above average); and

Bulgaria, Croatia, Hungary, Poland, Portugal, and the Former Yugoslav Republic of

Macedonia (consistently within one standard deviation above average).
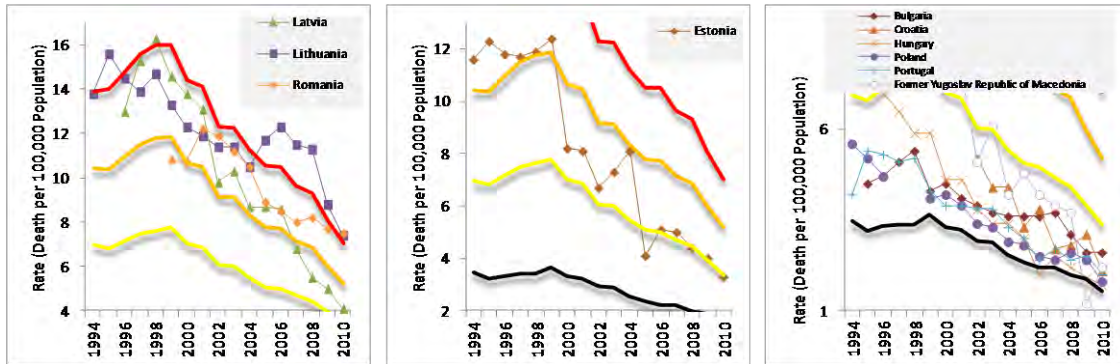
Figure 12. Tuberculosis Mortality differences by Standard Deviation

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat.

Ukraine's TB mortality data from WHO compared to the yearly average and three standard deviations of European Union TB mortality data from Eurostat is plotted from 1994 to 2010.
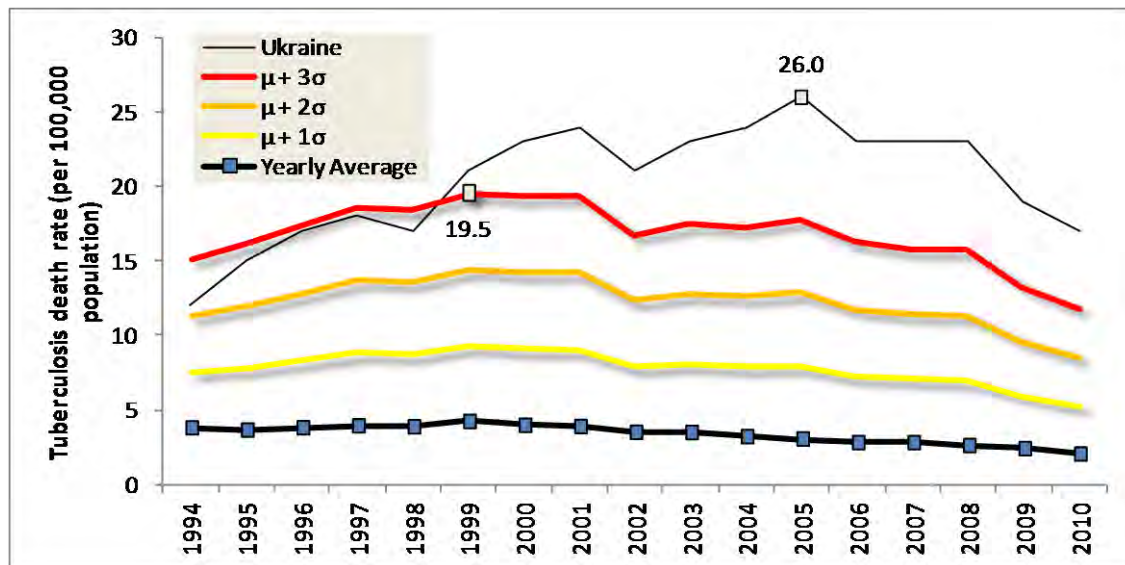
Figure 13. Ukraine Tuberculosis Mortality included in Average and Three
Standard Deviations of European Union Data

Source: Figure adapted by author from European Union, "Eurostat," accessed 31 January 2015, http://ec.europa.eu/eurostat; and WHO Data, accessed 9 March 2015, https://extranet.who.int/tme/generateCSV.asp?ds=estimates.

Geographical Proximity Comparison of TB

World Development Bank data for tuberculosis of 11 countries including Ukraine as compared from 1990 to 2013. Countries were selected for their geographical proximity to Ukraine. They include Estonia, Latvia, Lithuania, Belarus, Russian Federation, Georgia, Turkey, Moldova, Romania, Bulgaria, and Ukraine.
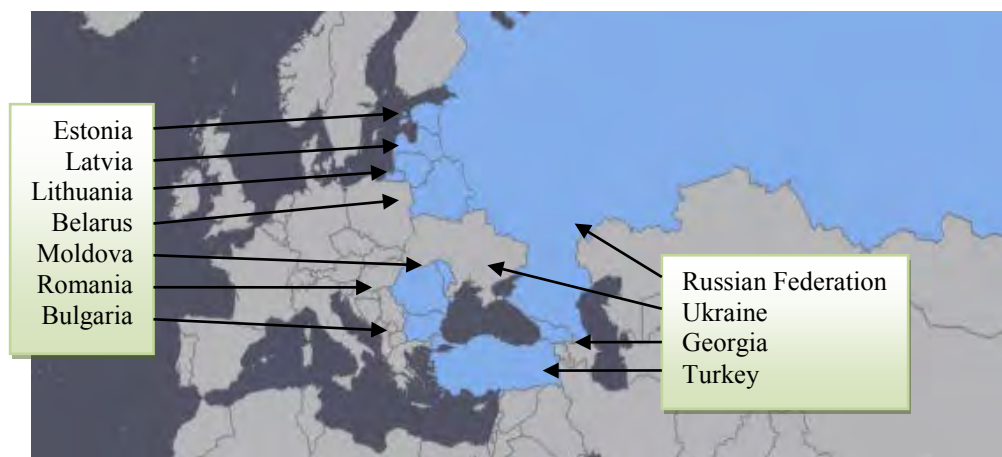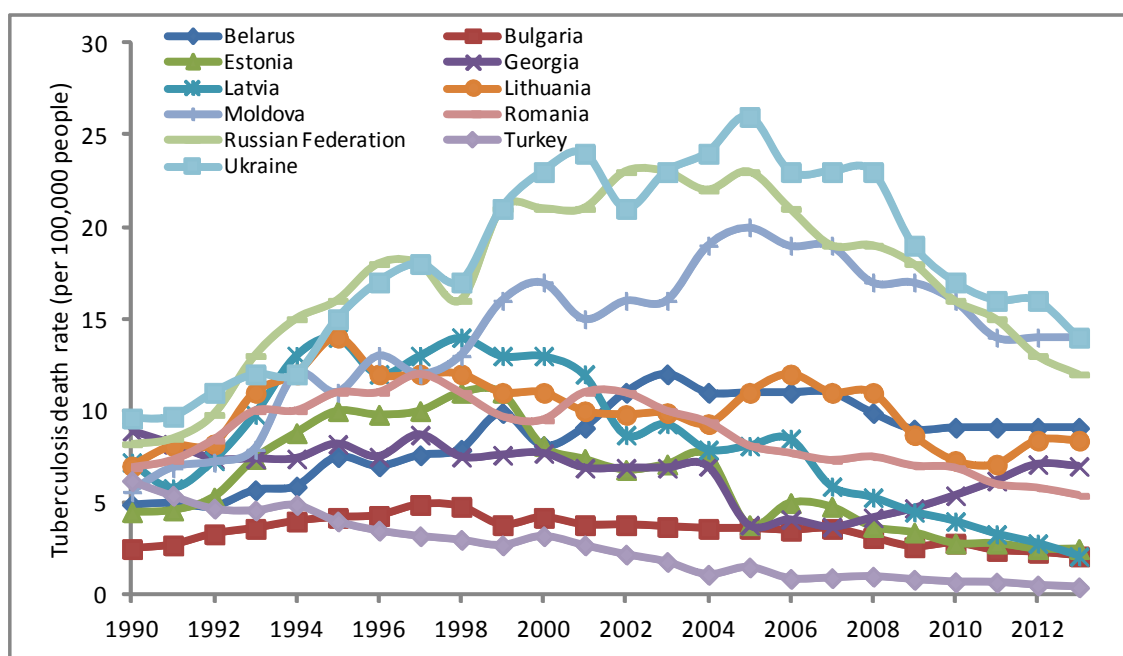
Figure 14. TB Mortality

World Development Bank definitions of TB data are:

"Prevalence of tuberculosis is the estimated number of TB cases (all forms) at a given point in time, expressed as the rate per 100,000 population. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.
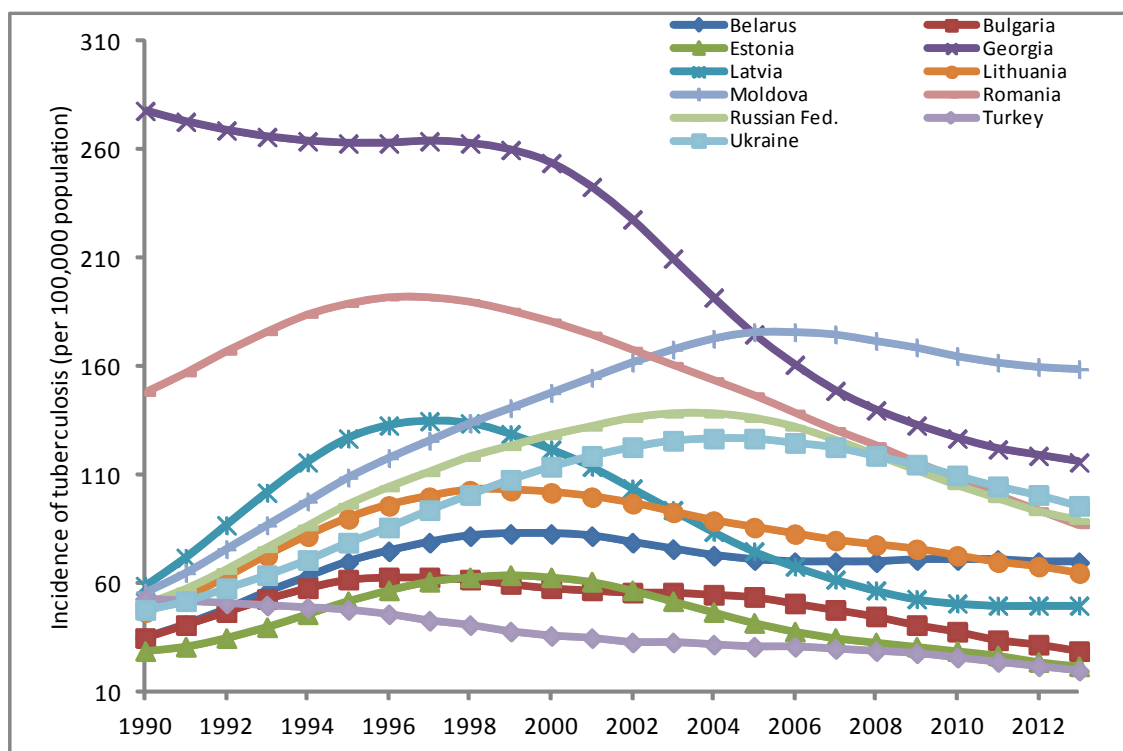
Incidence of tuberculosis is the estimated number of new and relapse tuberculosis cases arising in a given year, expressed as the rate per 100,000 population. All forms of TB are included, including cases in people living with HIV. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.

Tuberculosis case detection rate (all forms) is the number of new and relapse tuberculosis cases notified to WHO in a given year, divided by WHO's estimate of the number of incident tuberculosis cases for the same year, expressed as a percentage. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.

Tuberculosis treatment success rate is the percentage of all new tuberculosis cases (or new and relapse cases for some countries) registered under a national tuberculosis control programme in a given year that successfully completed treatment, with or without bacteriological evidence of success ("cured" and "treatment completed" respectively)." [76]

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[76] Definitions as quoted from the Metadata of the World Development Bank, "Tab=Series-MetaData," accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=health-nutrition-and-population-statistics.

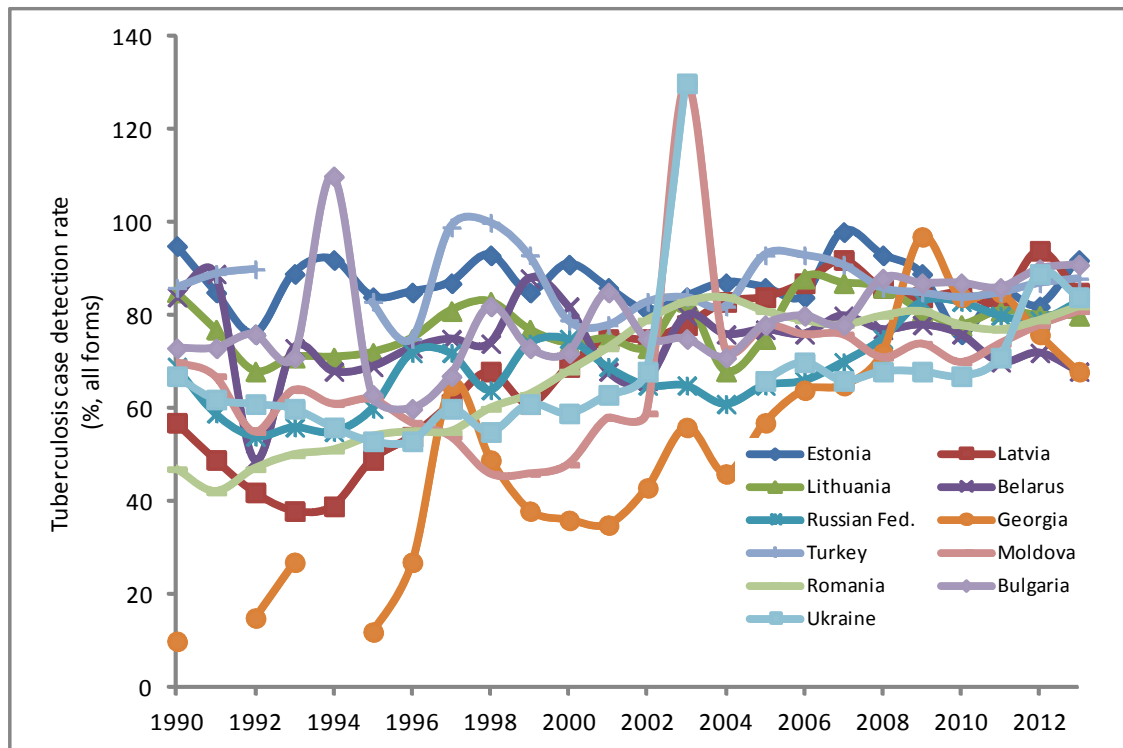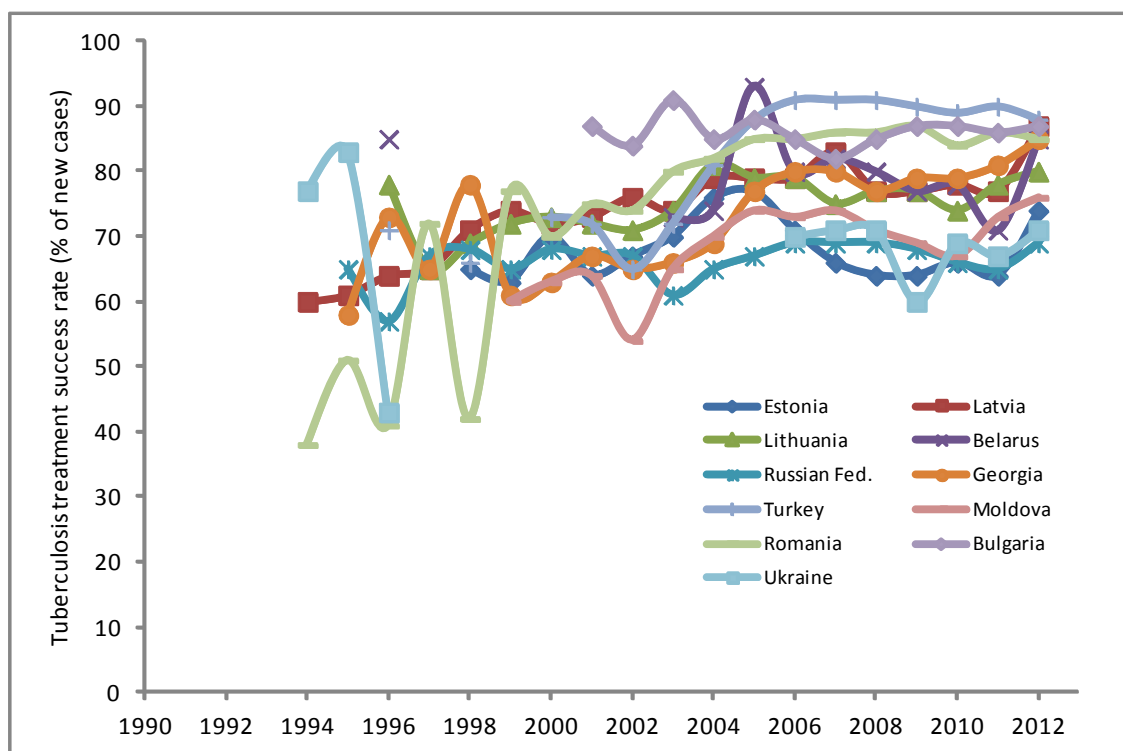# Prevalence and Incidence Comparison of TB
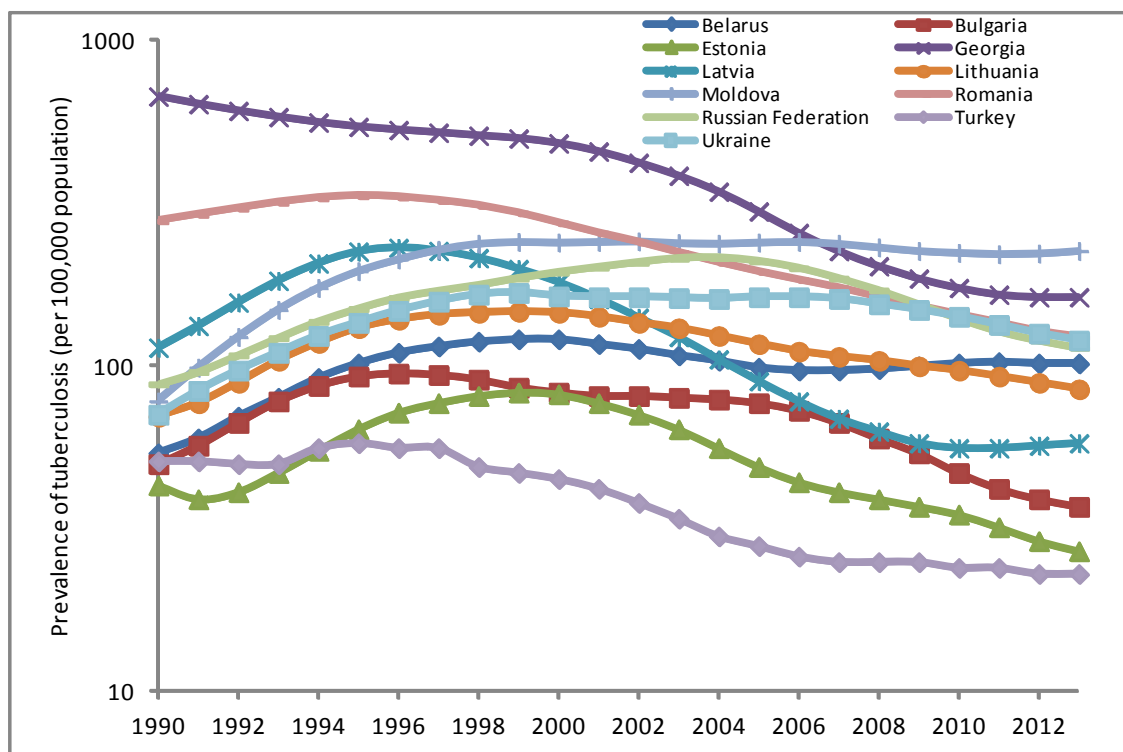
Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Surveillance and Response Comparison of TB

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

APPENDIX F

UKRAINE DATA TRENDS

World Development Bank defines data for Ukraine including birth rate, death

rate, population growth, net migration, health expenditures, and tuberculosis.

*"Birth rate, crude (per 1,000 people)-Crude birth rate indicates the number of
live births occurring during the year, per 1,000 population estimated at midyear.
Subtracting the crude death rate from the crude birth rate provides the rate of natural
increase, which is equal to the rate of population change in the absence of migration.*

*Death rate, crude (per 1,000 people)-Crude death rate indicates the number of
deaths occurring during the year, per 1,000 population estimated at midyear. Subtracting
the crude death rate from the crude birth rate provides the rate of natural increase,
which is equal to the rate of population change in the absence of migration.*

*Population growth (annual %)-Annual population growth rate for year t is the
exponential rate of growth of midyear population from year t-1 to t, expressed as a
percentage. Population is based on the de facto definition of population, which counts all
residents regardless of legal status or citizenship—except for refugees not permanently
settled in the country of asylum, who are generally considered part of the population of
the country of origin.*

*Net migration-Net migration is the net total of migrants during the period, that is,
the total number of immigrants less the annual number of emigrants, including both
citizens and noncitizens. Data are five-year estimates.*

*Improved sanitation facilities (% of population with access)-Access to improved
sanitation facilities refers to the percentage of the population using improved sanitation
facilities. The improved sanitation facilities include flush/pour flush (to piped sewer
system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with
slab, and composting toilet.*

*Improved water source (% of population with access)-Access to an improved
water source refers to the percentage of the population using an improved drinking water
source. The improved drinking water source includes piped water on premises (piped
household water connection located inside the user's dwelling, plot or yard), and other
improved drinking water sources (public taps or standpipes, tube wells or boreholes,
protected dug wells, protected springs, and rainwater collection).*

*Health expenditure, total (% of GDP)-Total health expenditure is the sum of
public and private health expenditure. It covers the provision of health services
(preventive and curative), family planning activities, nutrition activities, and emergency*

aid designated for health but does not include provision of water and sanitation.

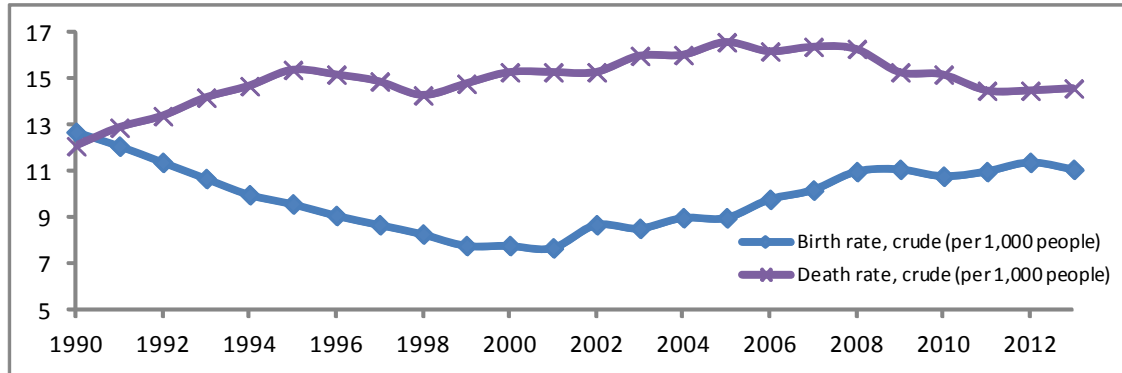*Health expenditure per capita (current US$)-Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Data are in current U.S. dollars.*

Prevalence of tuberculosis (per 100,000 population)-Prevalence of tuberculosis is the estimated number of TB cases (all forms) at a given point in time, expressed as the rate per 100,000 population. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.

Incidence of tuberculosis (per 100,000 people)-Incidence of tuberculosis is the estimated number of new and relapse tuberculosis cases arising in a given year, expressed as the rate per 100,000 population. All forms of TB are included, including cases in people living with HIV. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.
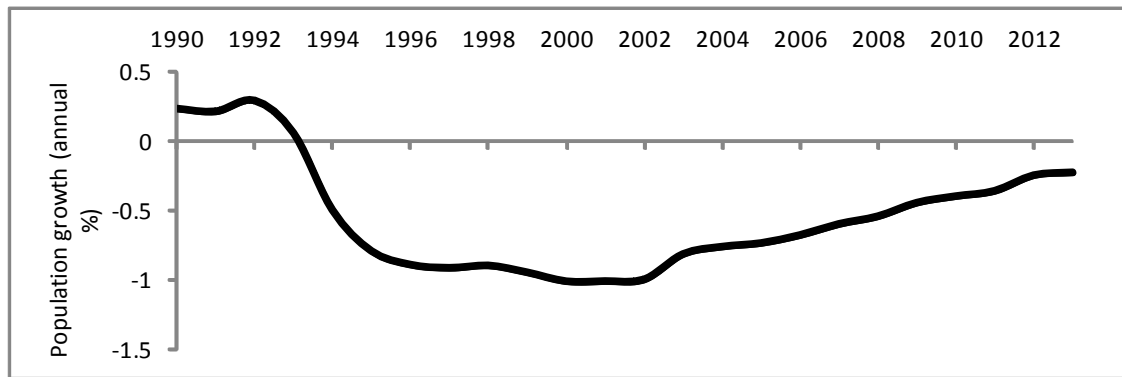
Tuberculosis death rate (per 100,000 people)-Tuberculosis death rate is the estimated number of deaths from tuberculosis among HIV-negative people, expressed as the rate per 100,000 population. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously."[77]

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[77] Definitions as quoted from the Metadata of the World Development Bank.
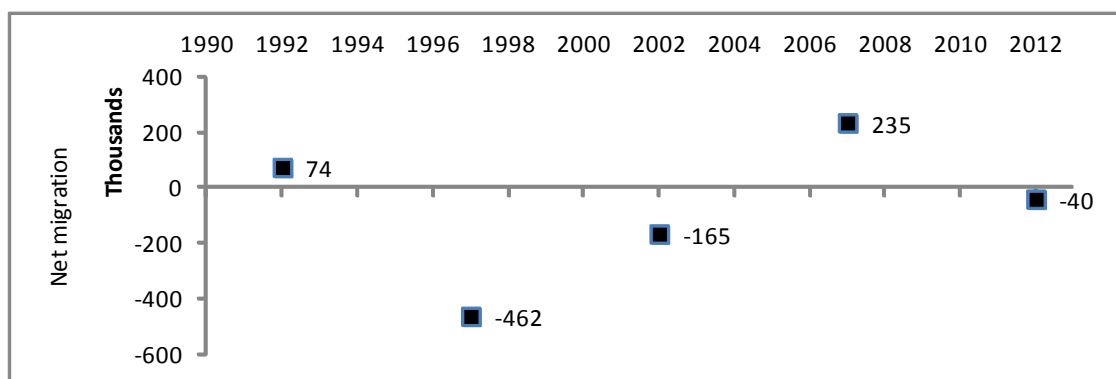
Ukraine Population Data

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.
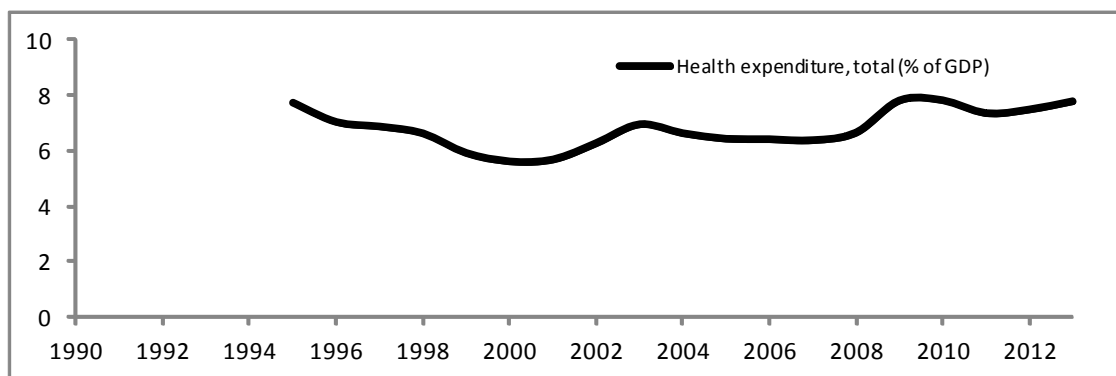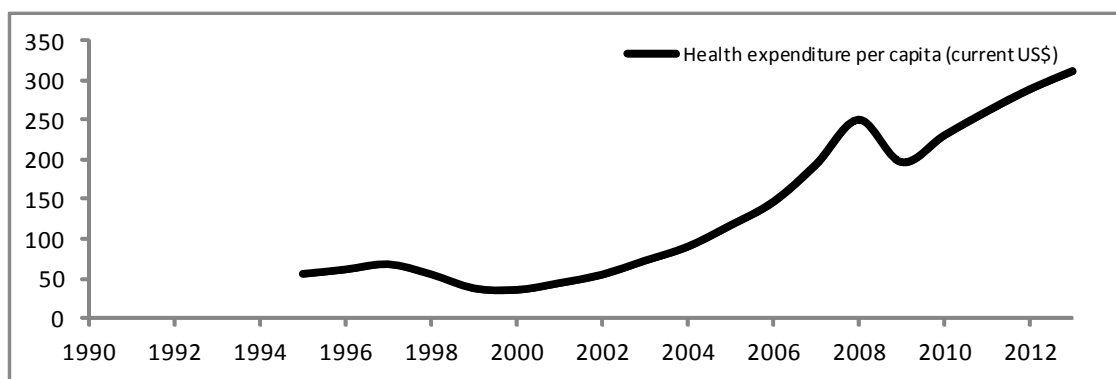

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.
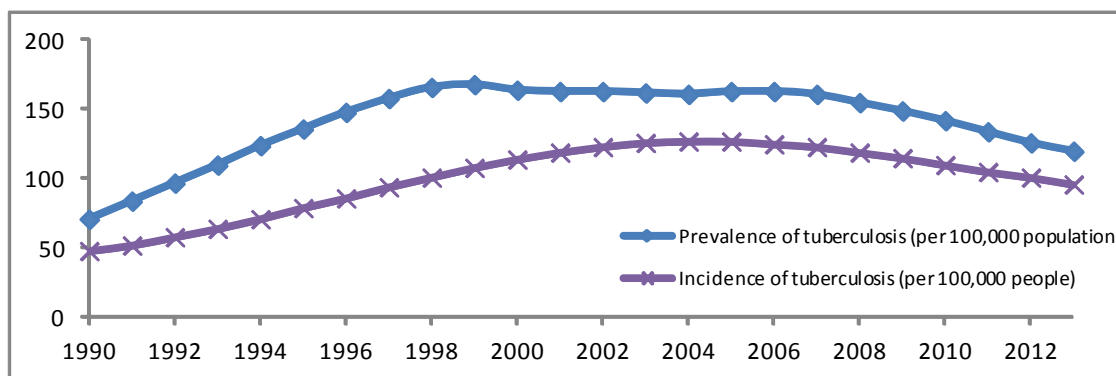
Ukraine Health Expenditure Data

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.
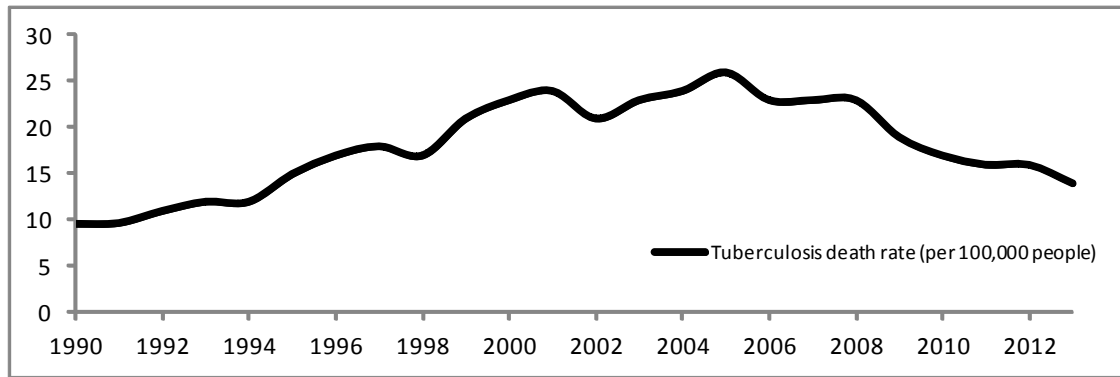
Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Ukraine Tuberculosis Data

Source: Figure adapted by author from World Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source= health-nutrition-and-population-statistics.

Source: Figure adapted by author from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/ selectvariables.aspx?source=health-nutrition-and-population-statistics.

Population to TB Rates in Ukraine

World Health Organization data for Ukraine population and TB data per 100,000 population are plotted from 1990 to2013. World Health Organization defines the following metrics:

"*e_prev_100k: Estimated prevalence of TB (all forms) per 100 000 population*

e_inc_100k: Estimated incidence (all forms) per 100 000 population

c_cdr: Case detection rate (all forms), percent

e_pop_num:Estimated total population number

e_mort_exc_tbhiv_100k:Estimated mortality of TB cases (all forms, excluding HIV) per 100 000 population"[78]

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[78] WHO TB Data Dictionary, accessed 9 March 2015, https://extranet.who. int/tme/generateCSV.asp?ds=dictionary.
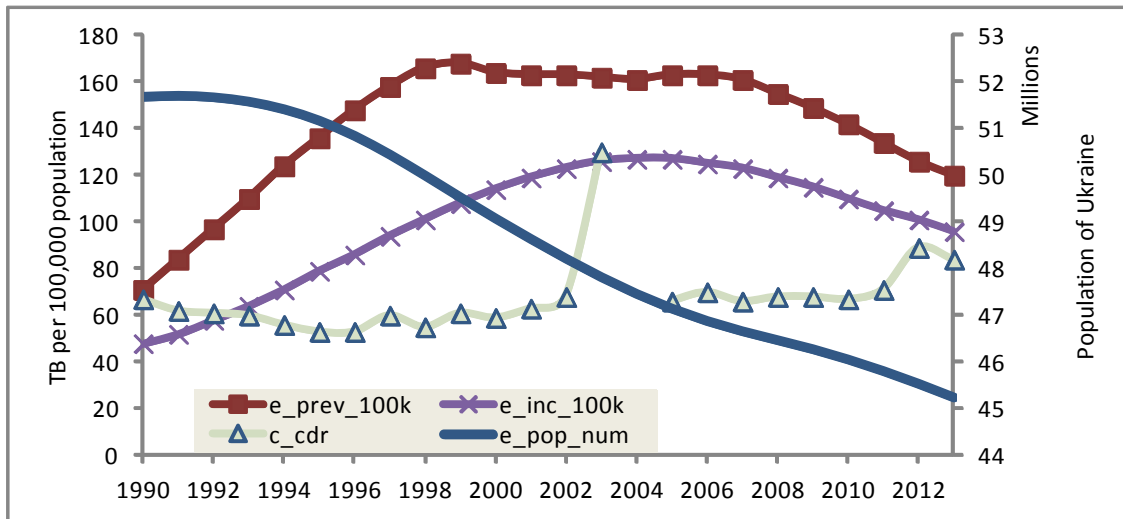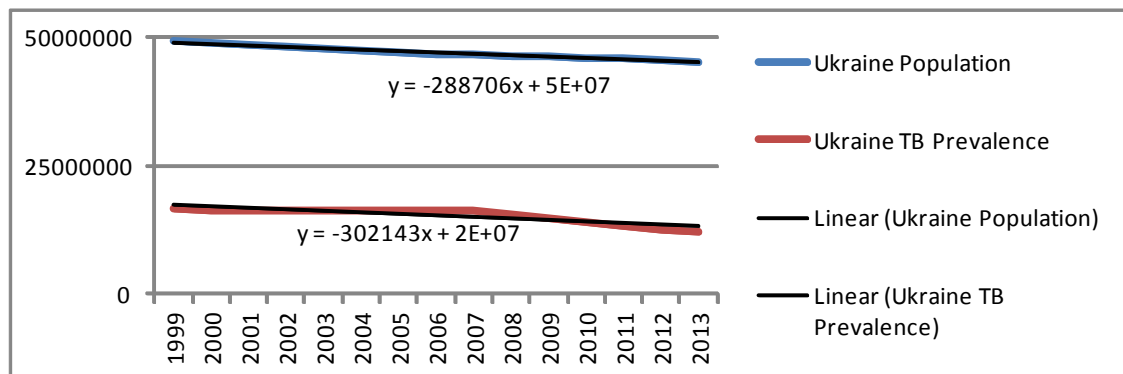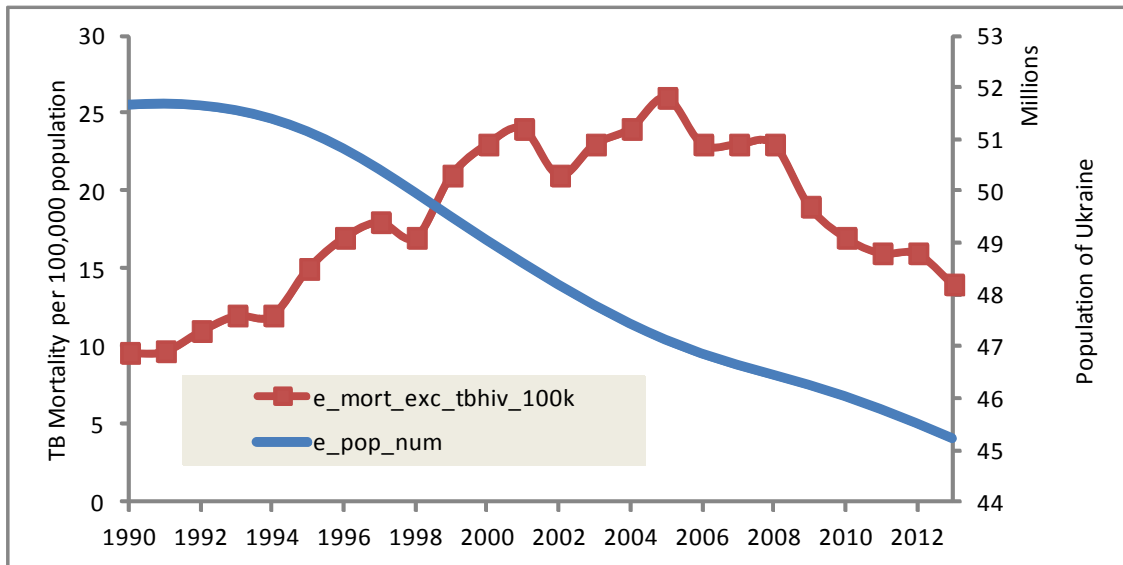
Figure 15. Ukraine Population and TB Rate Comparison
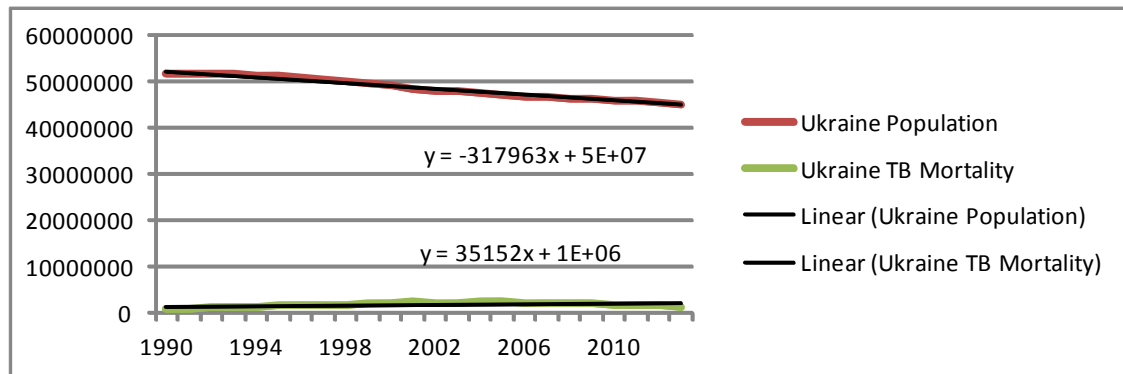
Source: Adapted from data from World Health Organization, accessed 9 March 2015, https://extranet.who.int/tme/generateCSV.asp?ds=estimates.

Source: Adapted from data from World Health Organization, accessed 9 March 2015, https://extranet.who.int/tme/generateCSV.asp?ds=estimates.

Source: Adapted from data from World Health Organization, accessed 9 March 2015,
https://extranet.who.int/tme/generateCSV.asp?ds=estimates.

Source: Adapted from data from World Health Organization, accessed 9 March 2015,
https://extranet.who.int/tme/generateCSV.asp?ds=estimates.

$y = -228745x + 5E+07$

$y = -148333x + 3E+06$

Legend:
- Ukraine Population
- Ukraine TB Mortality
- Linear (Ukraine Population)
- Linear (Ukraine TB Mortality)

Source: Adapted from data from World Health Organization, accessed 9 March 2015, https://extranet.who.int/tme/generateCSV.asp?ds=estimates.
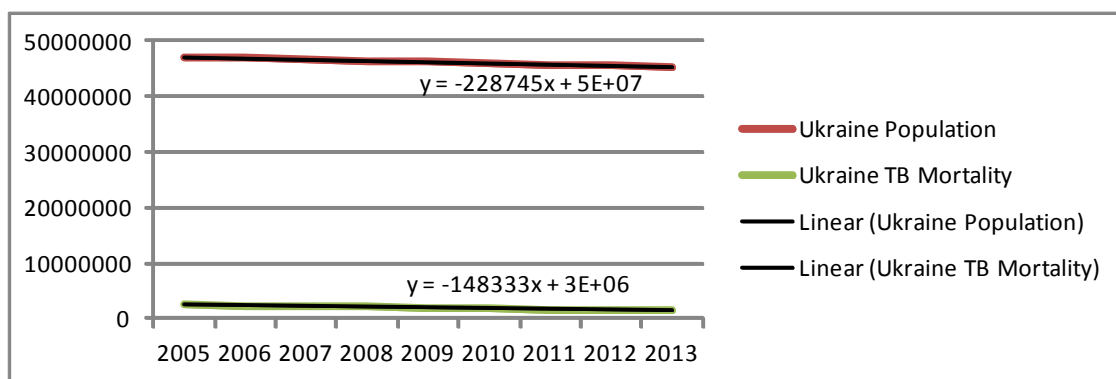
Ukraine Sanitation—Water Source Data

Legend:
- Improved sanitation facilities (% of population with access)
- Improved water source (% of population with access)
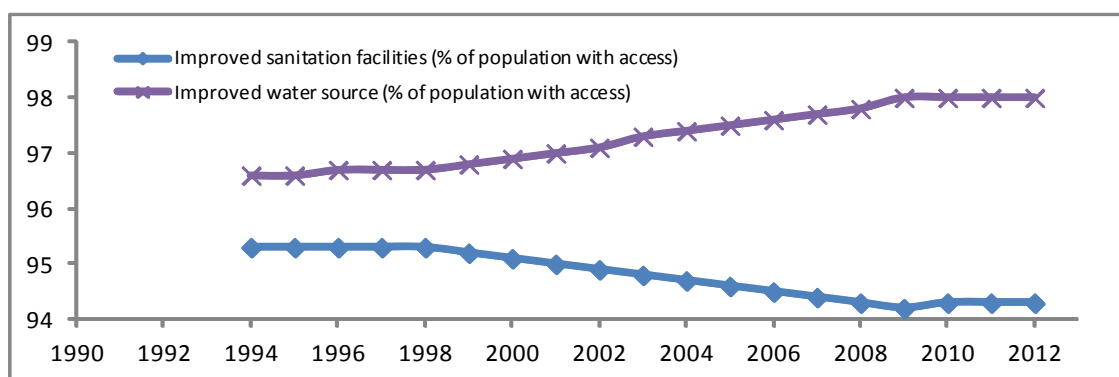
Source: Adapted from data from World Development Bank, accessed 30 April 2015, http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source= health-nutrition-and-population-statistics.

Ukraine Cholera Data

The World Health organization database included the number of reported cases of

cholera for Ukraine from 1990 to 2013.
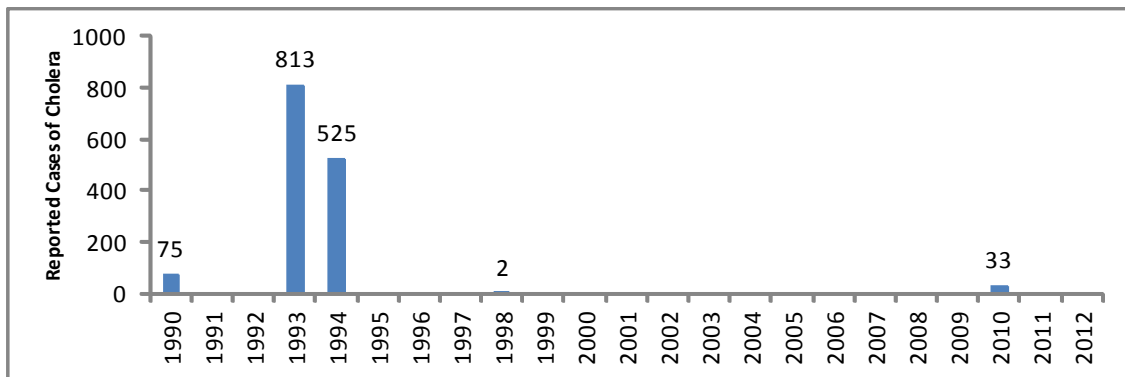
Source: Figure adapted by author from World Health Organization, "Cholera: Number of Reported Cases," accessed 11 February 2015, http://apps.who.int/gho/data/ node.main.175?lang=en.

APPENDIX G

MILITARY EXERCISES

The United States participates in military exercises with Ukraine.

Current as of	OAR	What	When	Title	Description
26-Jun-14	Jul 2014	Land	21-Mar-14	Exercise Saber Guardian 14	Exercise Saber Guardian 14: (Bulgaria, March 21 - April 4) Approximately 550 U.S. service members, with Armenia, Azerbaijan, Belgium, Bulgaria, United Kingdom, Georgia, Moldova, Poland, Romania, Turkey and Ukraine. The exercise was a U.S. Army Europe and Bulgarian Land Forces-led combined Joint Task Force and brigade command post exercise /computer-assisted exercise. This exercise was designed to strengthen international agency and military partnering, foster trust and improve interoperability between NATO and partner nations involved in foreign humanitarian assistance operations with U.S. forces.
29-Jan-15	2014	Land	16-Sep-14	Exercise Rapid Trident 14	Exercise Rapid Trident 14: (Yavoriv, Ukraine, Sept. 16-26) This exercise improved interoperability between U.S., NATO members and Partnership for Peace (PfP) nations while promoting regional stability and security; strengthening international military partnering; and fostering trust. Forces from 15 countries – Ukraine, Azerbaijan, Bulgaria, Canada, Georgia, Germany, Great Britain, Latvia, Lithuania, Moldova, Norway, Poland, Romania, Spain, and the U.S., as well as representatives from NATO – participated in the exercise. Overall, RT14 consisted of a multi-national field training exercise with a focus on interoperability among U.S. and NATO/PfP forces members while supporting Ukraine's Annual National Program designed to achieve Ukrainian Land Forces' interoperability with NATO and to support its NATO Operational Capabilities Concept Evaluation and Feedback Program.
29-Jan-15	2014	Land	13-Aug-14	Exercise Saber Junction 14/Exercise Steadfast Javelin II	Exercise Saber Junction 14/Exercise Steadfast Javelin II: (Grafenwohr and Hohenfels Training Areas, Germany, Aug. 13 - Sept. 17) Approximately 2,500 U.S. forces, along with NATO, Albania, Bulgaria, Romania, Moldova, Serbia & Ukraine. This U.S. Army Europe/ NATO-led training event's objective is to train brigades to manage the complexities of 21st century threats, to include a non-combatant evacuation operation response computer exercise. The third phase of the exercise will include an Airfield Seizure in Latvia, using 14 C-130s and seven C-17s from USAFE, the Air National Guard and TRANSCOM
29-Jan-15	2014	Sea	8-Sep-14	Exercise Sea Breeze 14	Exercise Sea Breeze 14: (Black Sea, Sept. 8-10) Approximately 280 U.S. service members and forces from Ukraine, Georgia, Romania, Turkey and 2 NATO ships participated in the 17th iteration of this multinational maritime exercise. Co-hosted by U.S. and Ukrainian navies, the aim of the exercise was to improve maritime security in the Black Sea through increased interoperability and cooperation among regional Allies and partners.
29-Jan-15	Jan 2015	NA	NA	NA	No new exercise specifically reported
11-Mar-15	Mar 2015	NA	NA	NA	No new exercise specifically reported
1-May-15	May 2015	Upcoming	20-Jul-15	Exercise Saber Guardian / Rapid Trident 15	Exercise Saber Guardian / Rapid Trident 15: (Jul. 20-31) Exercise Saber Guardian / Rapid Trident is the combination of a Command Post Exercise held in Romania and a Field Training Exercise held in Ukraine scheduled to take place in July 2015. The exercise is part of U.S. European Command's Joint Exercise Program designed to enhance joint combined interoperability with allied and partner nations. Saber Guardian / Rapid Trident 2015 supports interoperability between Ukraine, the U.S., NATO member nations and other Partnership for Peace nations.

Source: US European Command, "Operation Atlantic Resolve," Communication and Engagement Directorate Fact Sheet, 26 June 2014, 1-6; US European Command, "Operation Atlantic Resolve (2014)," Communication and Engagement Directorate Fact Sheet, 29 January 2015, 1-12; US European Command, "Operation Atlantic Resolve (January 2015)," Communication and Engagement Directorate Fact Sheet, 29 January 2015, 1-4; US European Command, "Operation Atlantic Resolve (March 2015)," Communication and Engagement Directorate Fact Sheet, 11 March 2015, 1-5; US European Command, "Operation Atlantic Resolve (May 2015)," Communication and Engagement Directorate Fact Sheet, 1 May 2015, 1-6, accessed 24 January 2015, http://www.defense.gov/home/features/2014/0514_atlanticresolve/.

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